DECEMBER, 1952 — FIFTY-NINTH YEAR

MACHINERY

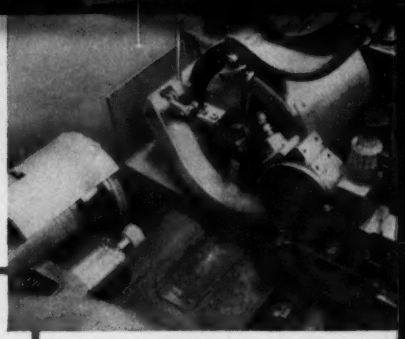
"Indispensable for Production when Extreme Accuracy is required"

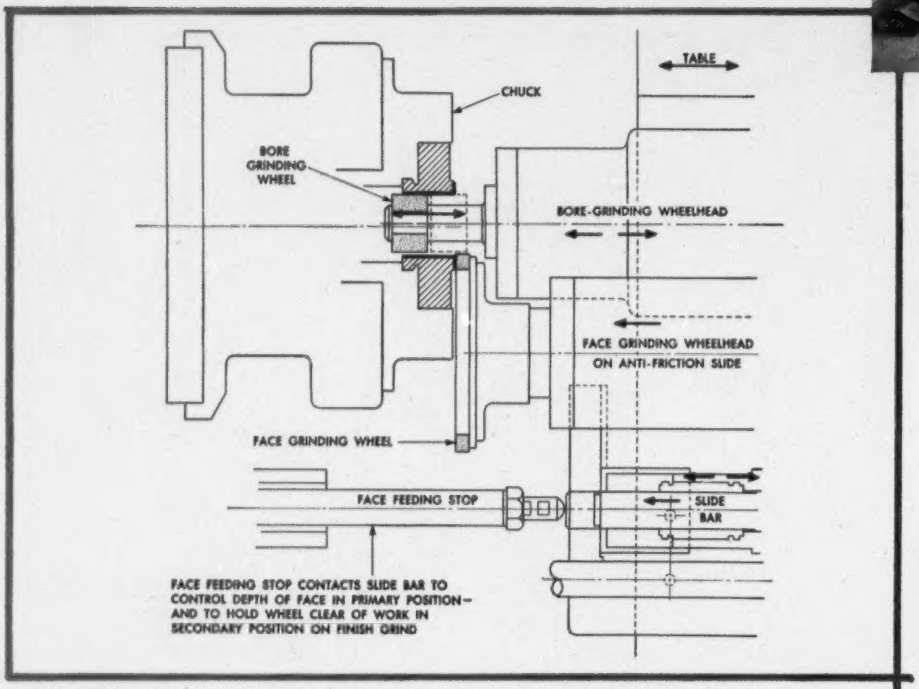


HARDINGE MODEL HCT, HIGH SPEED PRECISION CHUCKING MACHINE

Finishes diameters, recesses, shoulders, back faces, front faces, and cuts precision threads in one setting—all concentric with each other.

how to grind a BORE and FACE at the same time





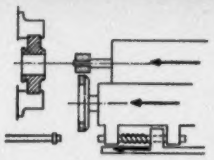
Simplified schematic diagram of grinding wheel arrangement which permits the bore grinding wheel to reciprocate while the face grinding wheel is held forward against the work.

Unique sliding-head design on Heald Model 271 Size-Matic permits grinding both surfaces in the time normally required for bore grinding alone

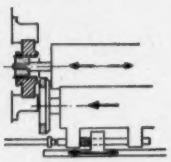
● This setup permits end facing and bore grinding at a single chucking, producing end faces square with bores. What's more, it does *both jobs* without adding to the normal bore grinding time — which means a big saving in total time per part. It is best applied on long production runs.

The facing wheel spindle is mounted on anti-friction slide bars, and is driven by a special motor with an extended stator. As the table reciprocates, the facing wheel is held stationary against the work and the driving rotor remains in the magnetic field of the stator, which moves back and forth with the table. An automatic feeding stop controls the face grinding depth, with provision for wheel face-wear compensation.

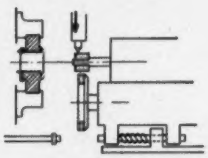
This is another example of how Heald engineering can help to increase your production and improve product quality. Remember — when it comes to precision finishing, it pays to come to Heald.



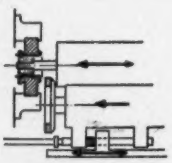
1. LOAD AND START Work is held in a diaphragm chuck and location is by pitch diameter of the gear teeth. Table is then rapid traversed to grinding position.



2. SEMI-FINISH GRIND BORE AND FACE Bore grinding wheel reciprocates with machine table, while facing wheel (mounted on anti-friction slide bars) is held forward against the work under spring pressure, as face feeding stop contacts slide bar to control depth of face grind.



3. DRESS BORE-GRINDING WHEEL Table runs out to dress position for automatic dressing of the bore grinding wheel.



4. FINISH GRIND BORE Dressed wheel reciprocates in bore for finish grind, while facing wheel is held away from work in a secondary position by face feeding stop. In this retracted position, facing wheel may be dressed manually, as required, while the bore is being finish ground.

HEALD

Heald precision speeds the nation's production

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

MACHINERY

VOLUME 59 **DECEMBER, 1952** NUMBER 4

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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ABC CCA NBP

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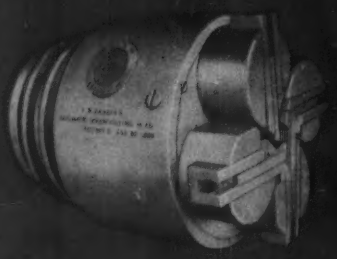
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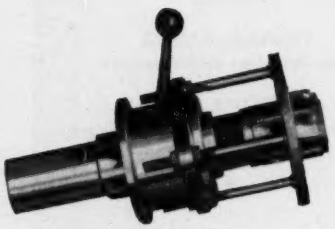
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From—



1889

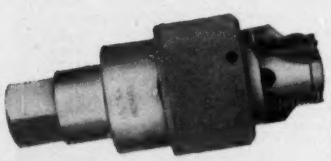
Today—



STYLE ALT
COLLAPSIBLE TAP



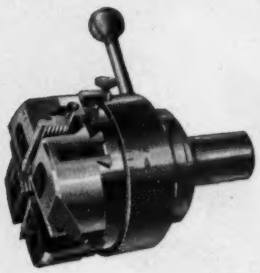
STYLE LL
RECEDING COLLAPSIBLE TAP



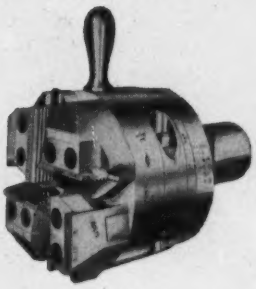
SOLID ADJUSTABLE TAP

The LANDIS Machine

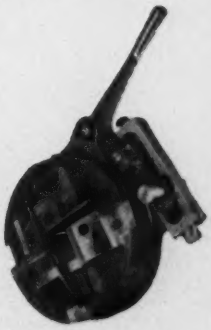
LANDIS THREADING TOOLS FOR EVERY THREADING JOB - - -



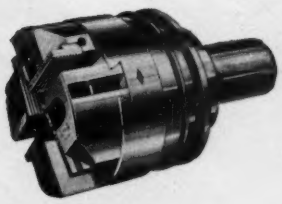
LANDMATIC HARDENED AND GROUND HEAD



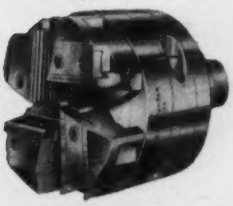
LANDMATIC HEAT TREATED HEAD



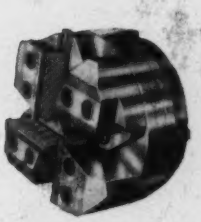
LANSTA HEAD



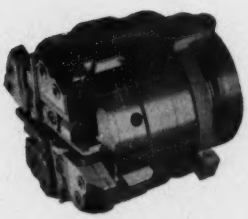
LANDEX HARDENED AND GROUND HEAD



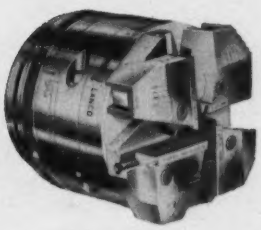
LANDEX HEAT TREATED HEAD



SOLID ADJUSTABLE HEAD



LANCO HARDENED AND GROUND HEAD



LANCO HEAT TREATED HEAD

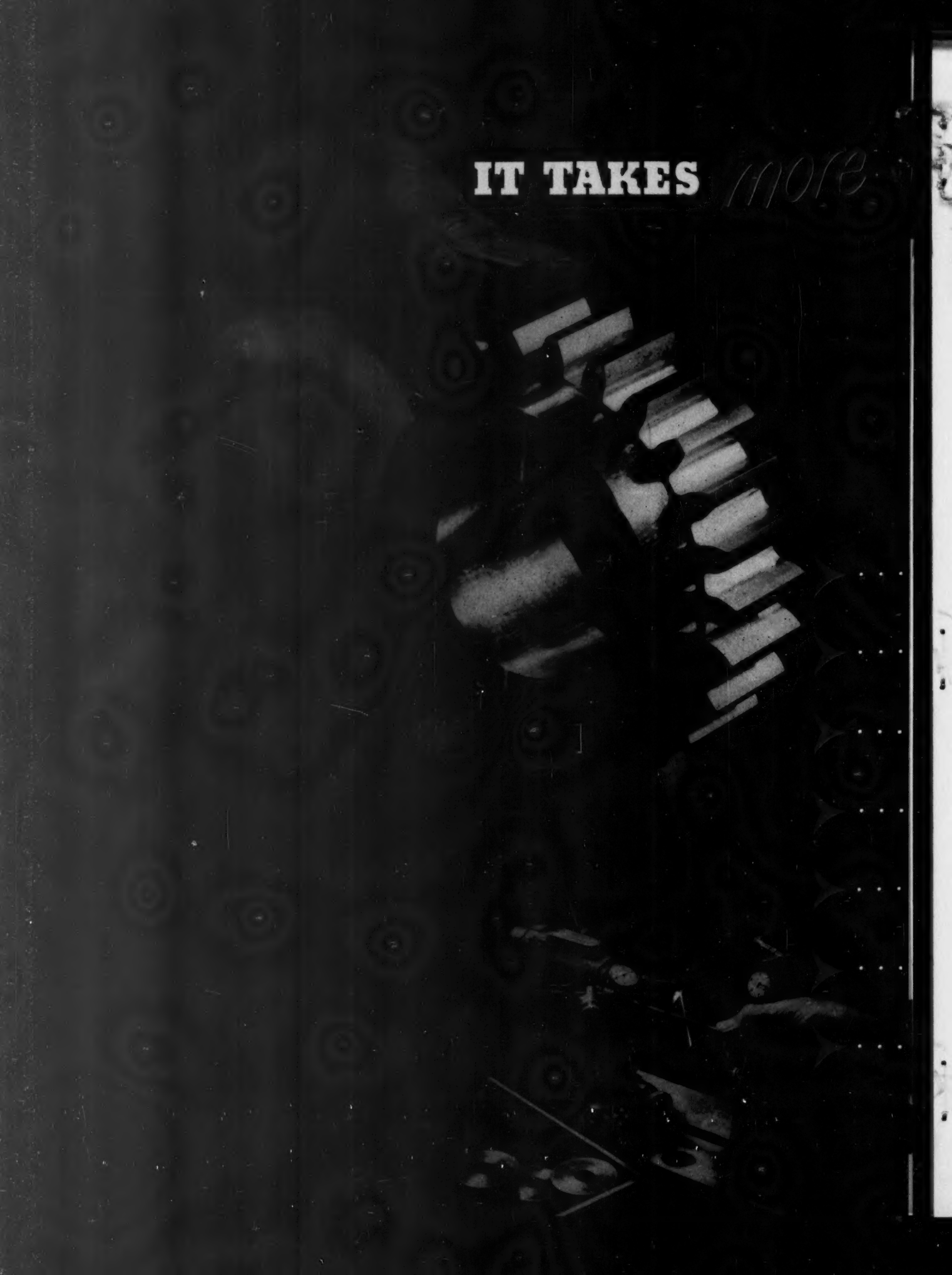
THE LANDIS CHASER



The Finest Thread Cutting Tool In Industry

COMPANY LANDIS WAYNESBORO PENNSYLVANIA

IT TAKES *more*



THAN A GOOD MACHINE

TO CUT A GOOD GEAR

it takes:

- **The determination to produce a quality product**
- **The establishment of adequate metallurgical "specs"**
- **Blanks to have precision-machined bores and faces**
- **Blanks to be held true with bore**
- **Real care given to set-up in mounting blank**
- **Fixtures to have precision locating-faces**
- **Studied balance between roughing and finishing cuts**

As every gear man knows, the control inherent in the Fellows Method can turn out gearing of super accuracy.

But—since accuracy in gearing is directly related to all preceding operations, it is necessary to plan ahead of the actual cutting if any machine is to do its super-accurate work.

Blanks, for example, must be accurately machined... mounting must be executed with utmost care... roughing and finishing speeds and feeds must be wisely proportioned. Then, the Gear Shaper, tooled with Original Fellows Cutters is unmistakably the experts' finest precision tool.

Of the same high order is Fellows Field Engineering Service. So, for high-accuracy gears, start by discussing your over-all plans with an engineer from the Fellows Office nearest you.

Fellows

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Export Dept., 78 River Street, Springfield, Vt.
Branch Offices: 323 Fisher Bldg., Detroit 2; 5835 West North Avenue, Chicago 39; 2206 Empire State Bldg., New York 1

Grinding Carbon Rods

an unusual centerless job

with the usual CINCINNATI advantages

Unusual applications are becoming more commonplace for the versatile CINCINNATI FILMATIC No. 2 Centerless Grinder. To mention a few: glass syringe plungers, billiard balls, cast iron tensile test specimens, pen and pencil parts, torsion bars, fishing reel spindles and a wide variety of defense items. And now carbon rods are rough ground from square to round in one pass, at a thrufeed rate of 20 feet per minute. Then a finish grinding operation on a No. 2 Centerless produces accurate roundness and sizing within .0005". Small diameter carbon rods, below ½", are usually ground in three or four passes. ¶ Shops that discard old grinding methods and assign their work to CINCINNATI FILMATIC Centerless Grinders can count on these advantages:

a) Little or no down time, because of FILMATIC grinding wheel spindle bearings and other features of sound engineering.

b) Simple changing of wheels and work rest blades.

c) Close limits of accuracy, promoted by rugged construction and sensitive slide adjustment.

d) Simple, easy to operate.

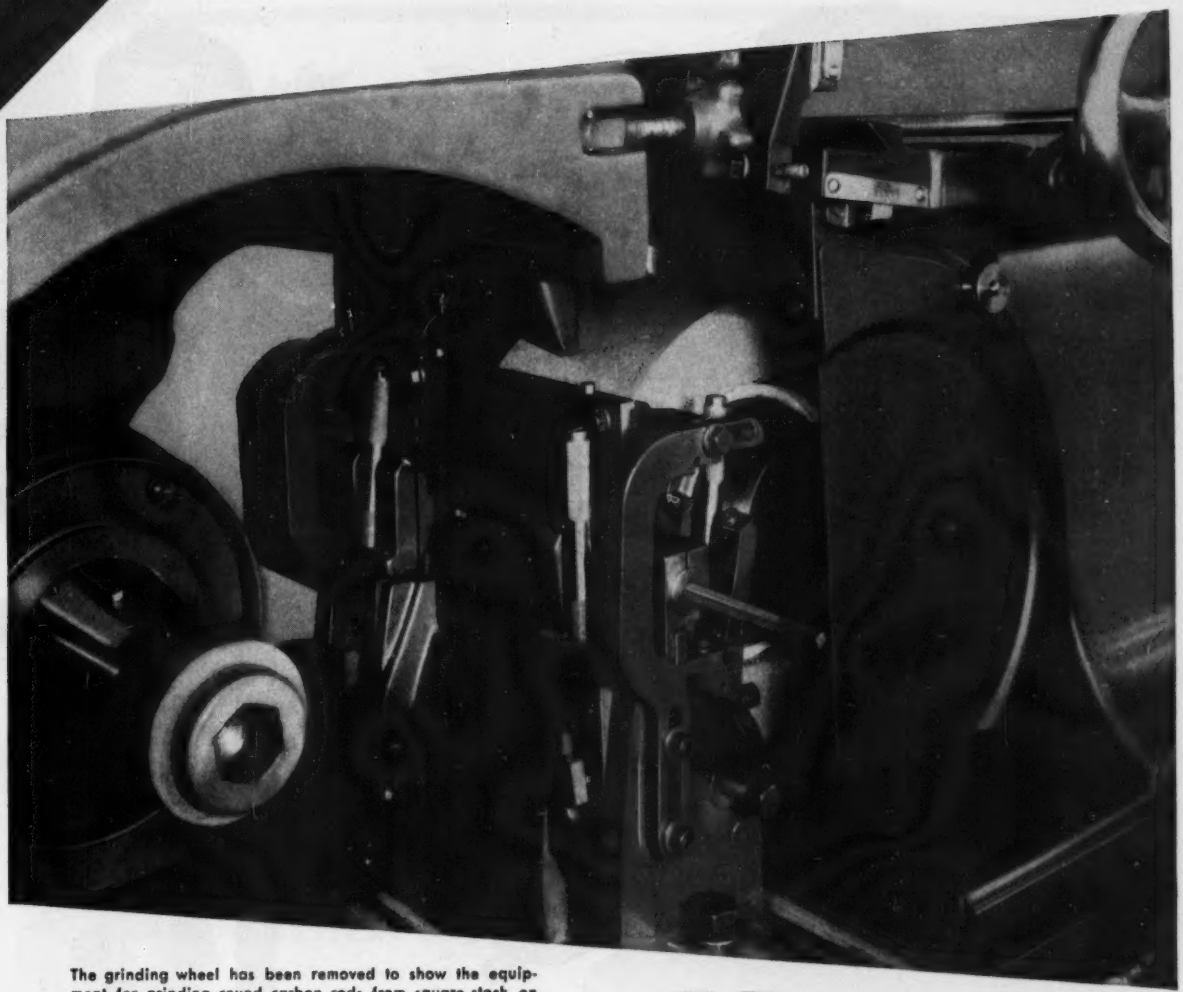
You may not be interested in grinding carbon rods, but you can't overlook the advantages of low-cost precision grinding offered by CINCINNATI FILMATIC No. 2 Centerless Grinders. ¶ Why not re-examine your cylindrical grinding operations with the idea of improving results through the centerless method of grinding. Catalog No. G-611 gives you complete details of these reliable, low-cost producers.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-611.

CINCIN



The grinding wheel has been removed to show the equipment for grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder. This setup is applicable to grinding other materials having the approximate consistency of carbon rods.

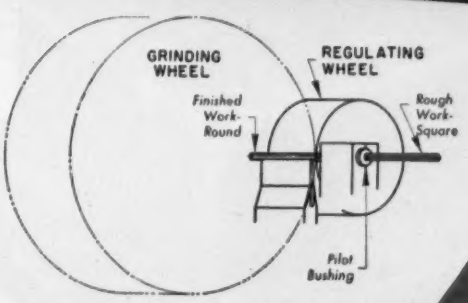


Diagram showing principle of operation, grinding round carbon rods from square stock, on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

FILMATIC

CINCINNATI

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

"See what the







No. 16 Ram Type Miller. Size: 37" x 9½" Cutterhead set in vertical position. Available with plain or universal saddle

"It pays to Van Normanize"

Adjustable Cutterhead

Can Do For You...

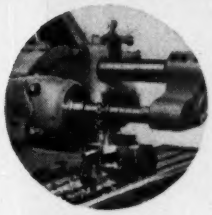
...and you will buy VAN NORMAN Ram Type Millers"

Van Norman Ram Type Millers give you every advantage for reducing milling costs. The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The movable ram plus the saddle cross feed increases the work range and capacity of these millers . . . enables you to handle larger work pieces with ease.

There is no waiting for single purpose machines because practically all milling operations can be accomplished on one Van Norman Ram Type Miller.

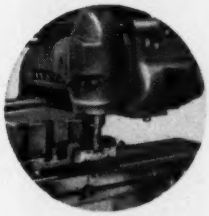
Whether it is for tool room, production line, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers will increase your production and cut costs.

Here's how one Van Norman Ram Type Miller does the work of three single-purpose machines.



HORIZONTAL MILLING

With the cutterhead locked in horizontal position, the Van Norman Ram Type Miller is used for horizontal milling operation. Hardened stop set at the factory assures positive 0° setting.



VERTICAL MILLING

The illustration above shows the Van Norman Ram Type Miller as it is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.



ANGULAR MILLING

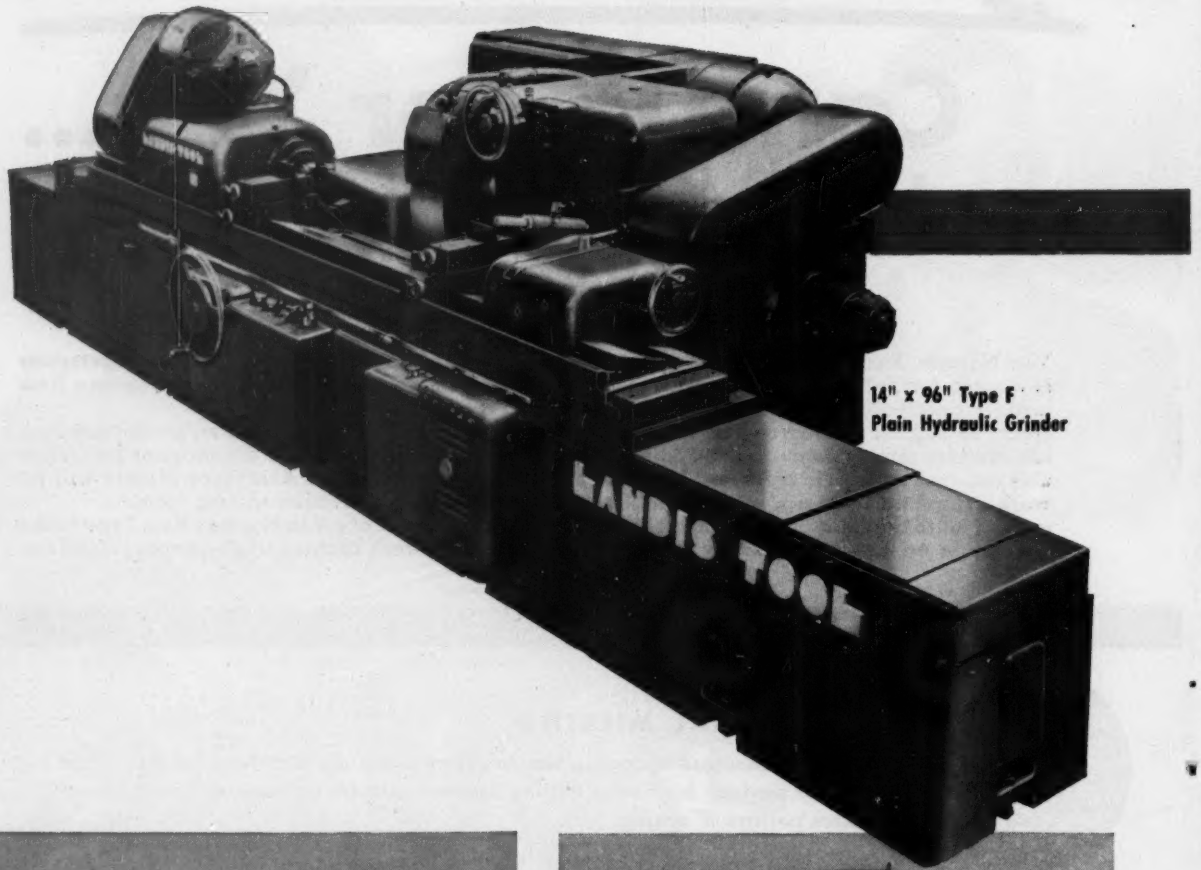
Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical or angular milling. All are easily performed on the Van Norman Ram Type Miller.

Van Norman Ram Type Millers are available in 6 basic models — No. 12, Table: 37½" x 9⅛"; No. 16 Table: 37" x 9½"; No. 22L Table: 45" x 10"; No. 26 Table: 58" x 13"; No. 36 Table: 64" x 14"; No. 38 Table: 64" x 14".

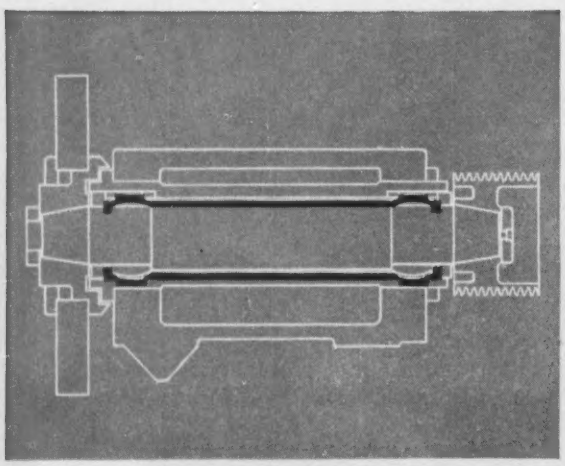
VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

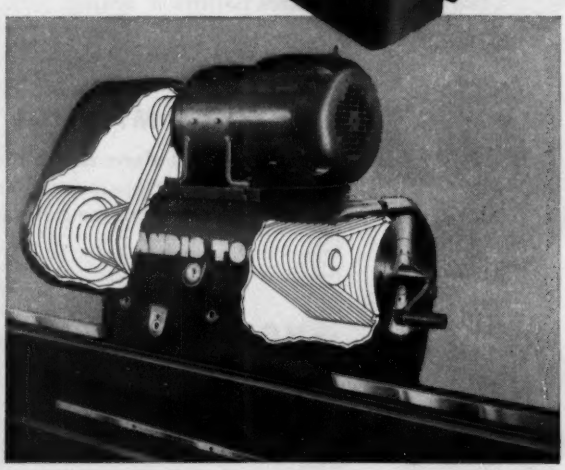
PERFORMANCE — The Only True Test



14" x 96" Type F
Plain Hydraulic Grinder



Pressure Lubricated Microsphere Spindle Bearings



Vee Belt Headstock Drive

LANDIS

precision grinders

of a Modern Precision Grinder

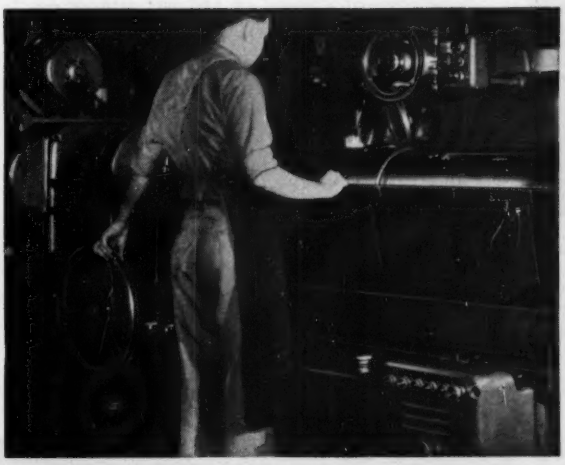
Performance is measured this way

- INCREASED PRODUCTION resulting in lower unit costs.
- UNIFORMITY OF WORK PIECES in size and finish.
- MINIMUM DOWNTIME for regular maintenance.

Performance features of Landis Type F plain grinders

- ADJUSTABLE HYDRAULIC AND ELECTRICAL CONTROLS for selection of correct feeds and speeds.
- CONTROLS EASILY ACCESSIBLE TO OPERATOR reduce operator fatigue.
- MICROSPHERE WHEEL SPINDLE BEARINGS have close clearance for fine finishes and quick sparkout.
- WHEEL SPINDLE has extra large diameter between bearings for maximum rigidity to withstand heavy cuts.
- VEE BELT DRIVES for work and wheel drives give smooth power transmission for fine finishes.
- PRESSURE LUBRICATED WAYS AND SPINDLE BEARINGS insure safe lubrication at all times.

For complete details write for Catalog F-48. Production estimates and tooling suggestions will be made on the basis of your blueprints.



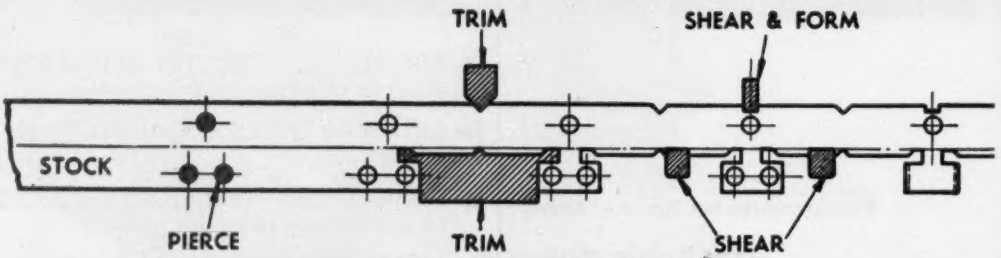
Grouped Operating Controls

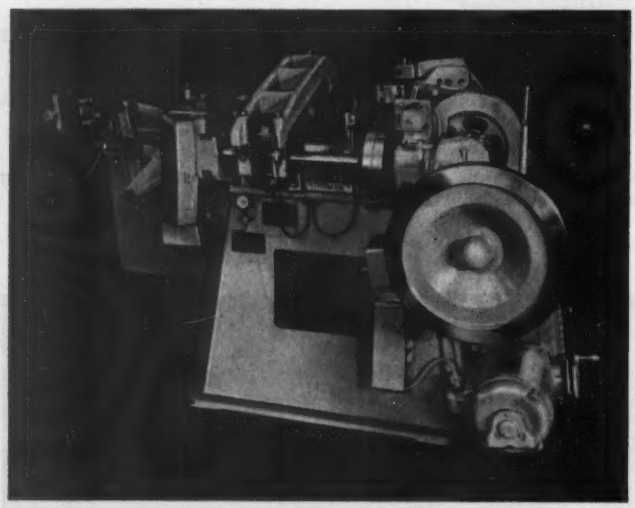


Adjustable Hydraulic Controls

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Formed Metal Stampings Produced Complete in the U. S. Eliminating Secondary Operations





The electrical part shown in ACTUAL SIZE above, opposite page, is produced from coil stock—complete, without further handling—at a speed of 140 per minute on the No. 28 U. S. Multi-Slide® Machine. Another example of the advantages of the Multi-Slide Machine for the precision fabrication of many types of metal parts calling for piercing, blanking, forming, swaging and embossing operations!

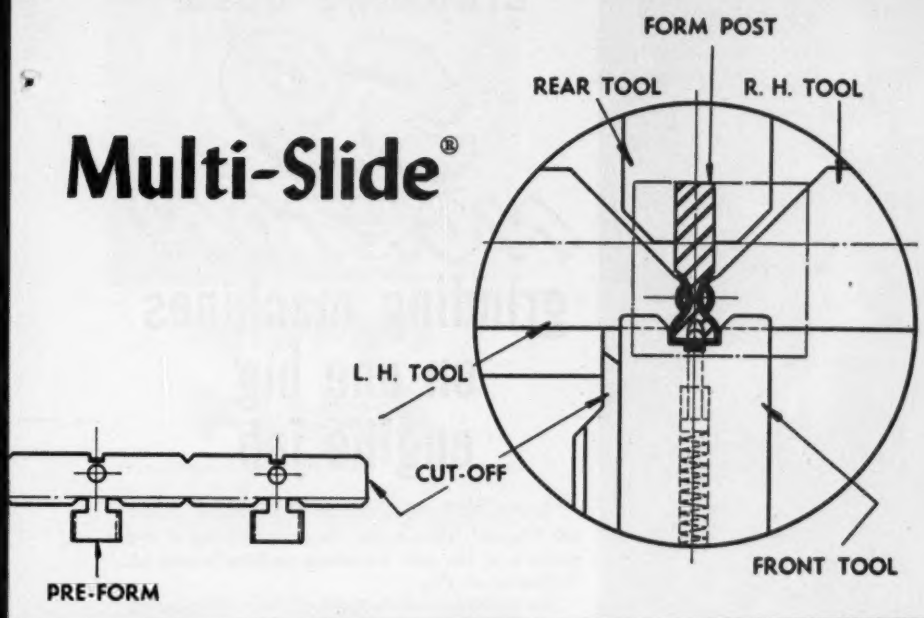
The part illustrated is made of phosphor bronze .025" thick, and the sequence of

SIZES AND SPECIFICATIONS U. S. MULTI-SLIDES

Machine Size	#11	#28	#33	#35
Length of Feed	3"	8"	12½"	12½"
Maximum Width of Stock	¾"	1½"	2½"	3"
Overall Size	44x40x66"	50x38x80"	54x49x120"	57x35x147"
Net Weight	1090#	2600#	5900#	9560#
Crated Weight	1290#	3000#	6300#	10230#
Motor Recommended	1½ HP	2 HP	5 HP	7½ HP

PRODUCTS
U.S. TOOL

Multi-Slide®



ACTUAL SIZE OF METAL STAMPING



operations is as follows: pierce 3 holes; trim top and bottom; shear and bend on top, shear on bottom; preform; cut off; finish form. This operation is shown in detail in the profile view within the circle.

The photograph at the left shows a No. 28 Multi-Slide Machine similar to the one used for this work. Multi-Slide Machines are made in four standard sizes to accommodate stock of various widths, thicknesses and feed lengths. Capacities for each size are detailed in table below the machine illustration. These machines save manpower, too—a single operator can attend to a battery of Multi-Slides, since operation is entirely automatic. Operator merely loads coils of material onto stock reel for feeding into machine.

Perhaps some of the formed metal parts produced in YOUR plant could be handled to greater advantage on the U. S. Multi-Slide. Bulletin M15 contains complete details, and your inquiries are invited.

® Trade Mark Registered—U. S. Patent Office

COMPANY, Inc. AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories



ASSEMBLY LINE FOR MODEL 895 ENGINES. In Lycoming's plant at Williamsport, Pa. Norton Grinding Machines are used in the grinding of components for this engine.

LYCOMING USES 59 NORTON grinding machines on one big engine job

"Lycoming-Built Ordnance Continental Model 895 Engine." That is the official description of the product of the new Lycoming engine factory at Williamsport, Pa.

Model 895 is an army tank engine — 6 cylinder, horizontal opposed, air cooled, made in both supercharged and unsupercharged types. For the many grinding operations required to build it, Lycoming engineers selected 59 Norton grinding and lapping machines — an installation worth talking about, worth your serious consideration.

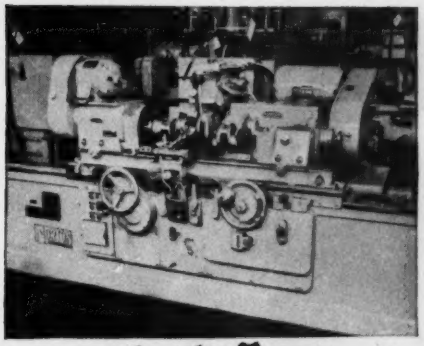
Some of Lycoming's Norton machines and the jobs they do are shown here. Perhaps you have jobs like these. Or perhaps your applications are entirely different. In either case, Norton will be glad to work with you on plans to fit standard or special grinding machines into your present or "post emergency" production.

Remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

For further information on the world's most complete line of grinders and lappers, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

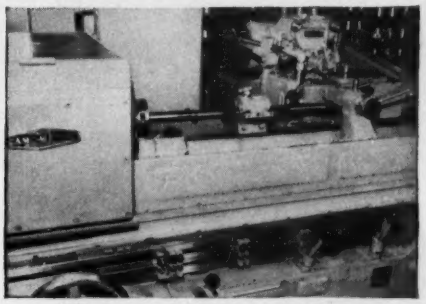


BATTERY OF 17 NORTON MACHINES. This picture shows an installation of seventeen 6" x 18" CTU Semiautomatics used for miscellaneous grinding of 80 different kinds of parts.



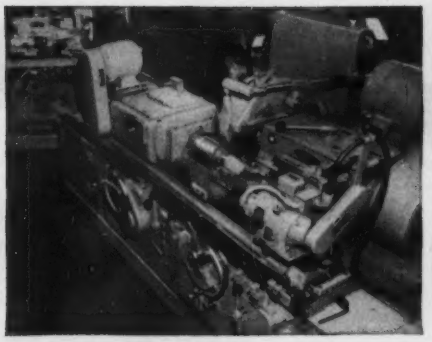


MAIN CRANKSHAFT BEARINGS are finish ground on Norton 14″ x 36″ LCTU Semiautomatic grinding machines. An interesting detail is that crankshafts are not centered to depth; therefore a base mounted locator is used on each machine. Crankshafts shown as forged and finish ground.



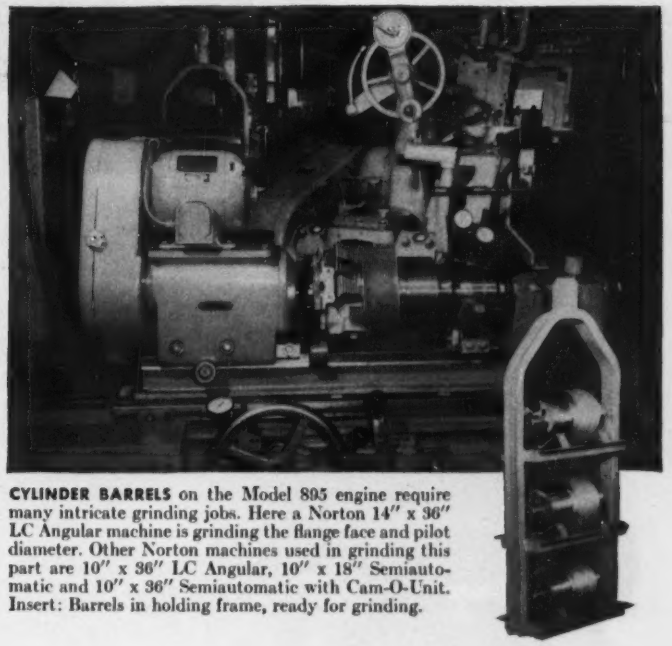


CAMSHAFTS are ground all over, with 3 grinds on the cam contours, all with small diameter wheels because of re-entrant curve. Norton 6″ x 30″ CTU Semiautomatic and No. 2 Cam-O-Matic machines are used. One of the latter is shown grinding the contours. Model 895 camshafts illustrated, before and after finish grinding.

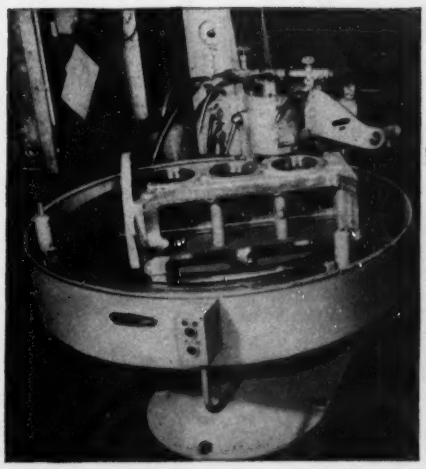


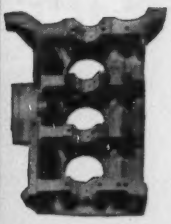


CAST ALUMINUM PISTONS are used in the unsupercharged engine, forged aluminum pistons in the supercharged. All are ground on Norton 10″ x 36″ CTU Semiautomatic grinding machines, equipped with the compound Cam-O-Unit and the self-contained motor driven truing device which trues the wheel. At right: A Model 895 piston forging and the finished product.



CYLINDER BARRELS on the Model 895 engine require many intricate grinding jobs. Here a Norton 14″ x 36″ LC Angular machine is grinding the flange face and pilot diameter. Other Norton machines used in grinding this part are 10″ x 36″ LC Angular, 10″ x 18″ Semiautomatic and 10″ x 36″ Semiautomatic with Cam-O-Unit. Insert: Barrels in holding frame, ready for grinding.





CRANKCASE JOINT FACES are lapped on Norton No. 2F lapping machines, using 36″ bonded abrasive laps. These machines do fast, precise work on soft metals, leaving a flat, clean surface which is free from imbedded lapping compound. View of crankcase shows the lapped surface.

To Economize, Modernize With NEW

NORTON

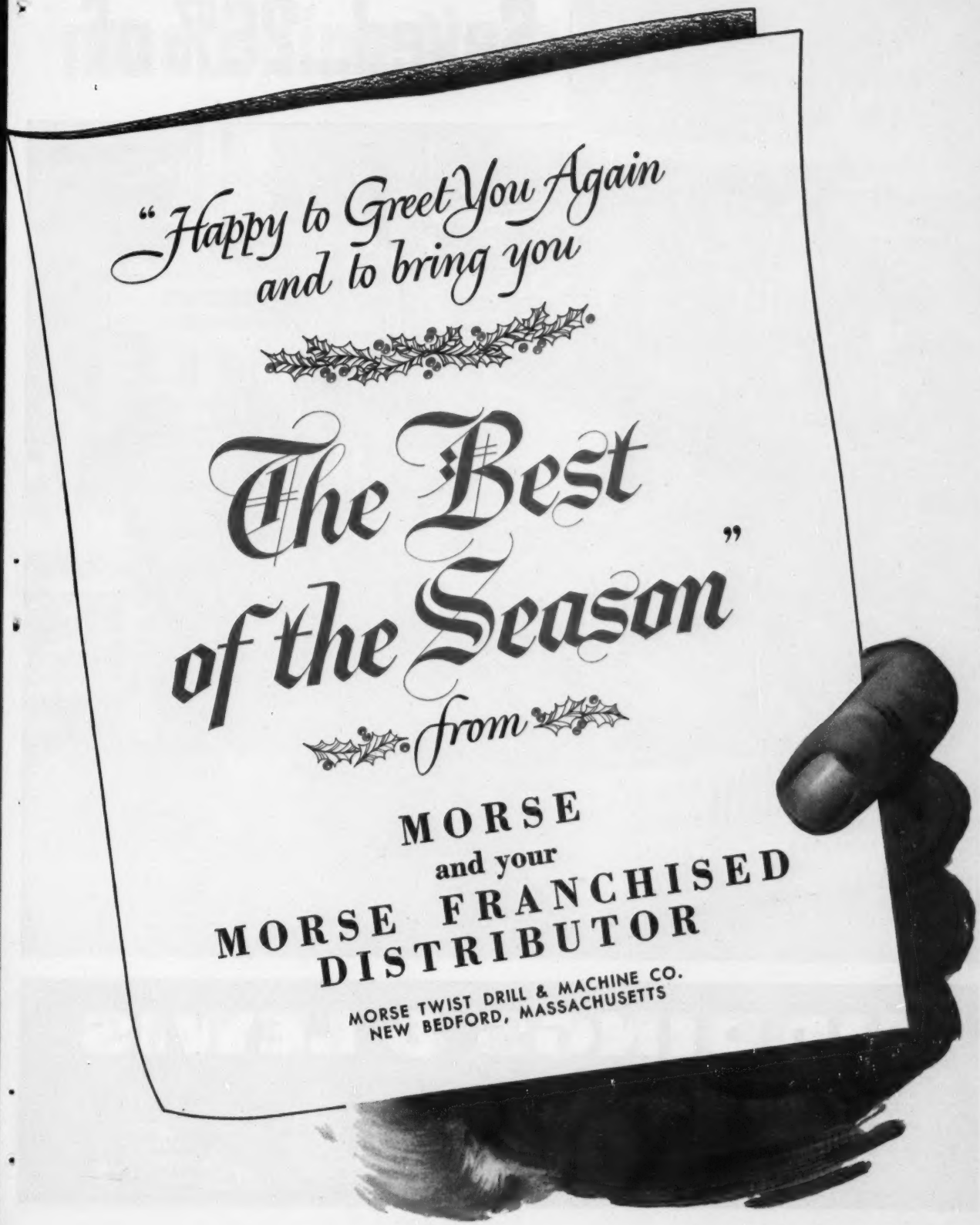
GRINDERS and LAPPERS

Making better products to make other products better

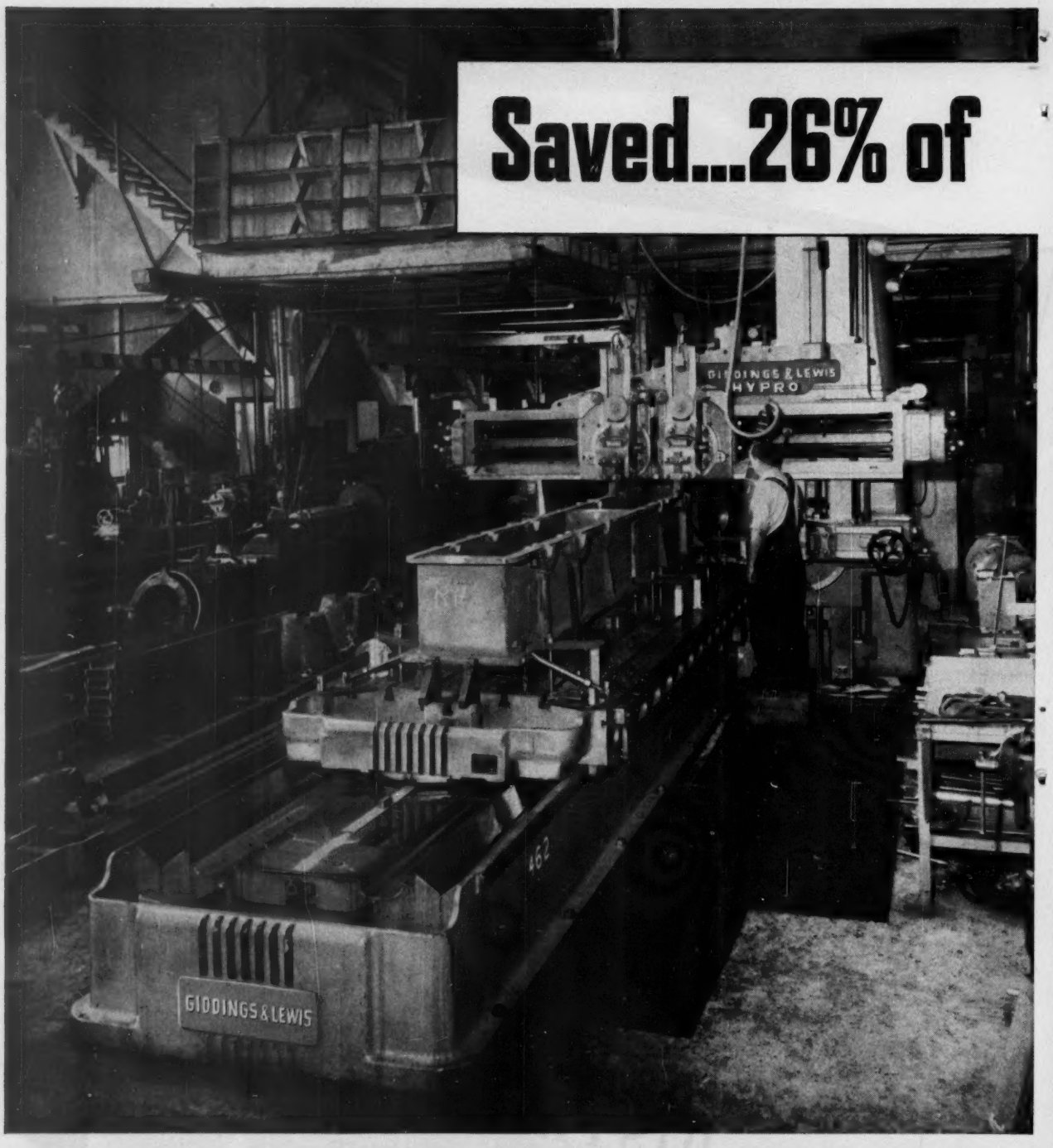
District Sales Offices: New York • Cleveland • Chicago • Detroit

In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

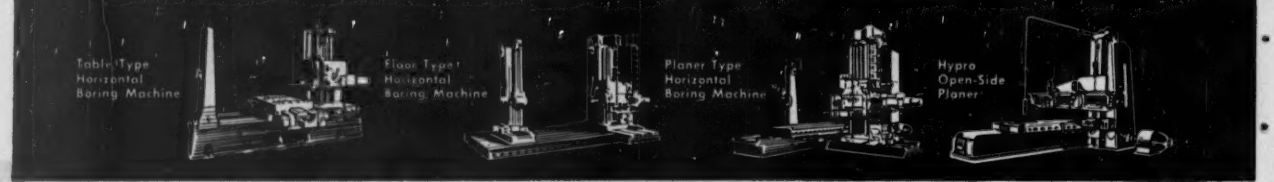



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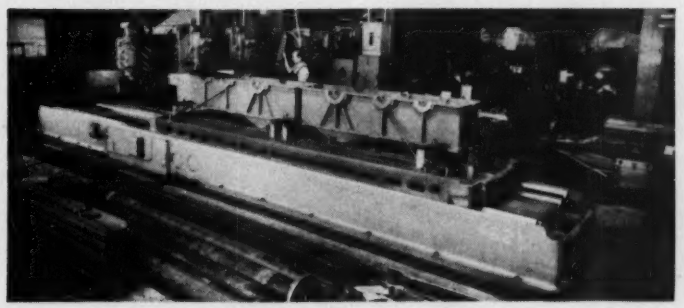
This G & L HYPRO Openside Planer machines these two gate hoists in 7½ hours

HERE'S another example of how the G&L 5-Point Analysis helped one company get the right machine for faster, more efficient production.

The D. J. Murray Manufacturing Co. of Wausau, Wis., builders of Murco products, formerly needed a little more than 10 hours to machine two bulky gate hoist housings. Then they bought a 62" x 16" G&L HYPRO Openside Planer. Now this machine, using two heads equipped with carbide tools and feeding at 150 fpm completes the job from floor to floor in just 7½ hours . . . a time saving of 26%.

This versatile machine is also being used to machine the covers, base and bearing housings for pulpwood chippers.

Like D. J. Murray, you too will find that for your work . . . large or small . . . simple or complex . . . you'll save time and money with a machine in the G&L line. And you can be sure G&L's unbiased Job Analysis Service will help you select the proper machine that will give you worth-while savings. See your nearest representative or write direct. There's no obligation . . . and DELIVERY ON G&L MACHINES MIGHT BE BETTER THAN YOU THINK!



Illustrations show how two large, 8'-4" x 24⅞" wide gate hoist castings are machined at one time. Openside construction makes these machines particularly good for large bulky workpieces.

G&L 5-POINT JOB ANALYSIS

takes guesswork out of machine tool buying... solves big or complex machining problems, increases production ... reduces machining costs

1. **COMPLETE STUDY** — G&L analysis engineers, with your engineers, analyze these factors: (A) number and size of parts to be produced, (B) number and types of operations required, (C) tolerances and finishes needed.

2. **MACHINING METHODS**—Considering requirements of each individual job, G&L engineers select your optimum machining method. Their report is unbiased because G&L builds a complete line of machines . . . plus a complete line of accessories and tooling for these machines.

3. **MACHINE SIZE, KIND, TYPE** — With the machining method determined in Point 2 —based on your production and work requirements — G&L engineers recommend the most efficient machine for the job.

4. **OPERATIONS PLAN** — After selection of the proper machine or machines, G&L engineers plan an operation sequence to (A) minimize setups and setup time, (B) utilize proper cutting tools, (C) take full advantage of the machine's capacities and working ranges, and (D) minimize operator fatigue.

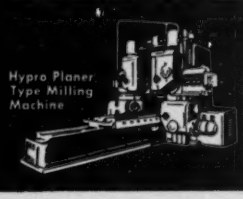
5. **TOOL USE** — G&L engineers will recommend the standard machine accessories, arrangements and tools you should use. If special equipment is needed, G&L engineers will design it to agreed specifications and make it a part of your order.

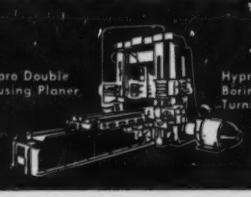
How to get a G&L job analysis

Write, wire or phone your nearest G&L dealer or write direct. Furnish our job analysis engineers with blueprints, job charts and production requirements. Your machining problems will be analyzed completely. There's no charge, no obligation. Don't hesitate — do it today!

G-18

MACHINE TOOL CO.







G&L HYPRO

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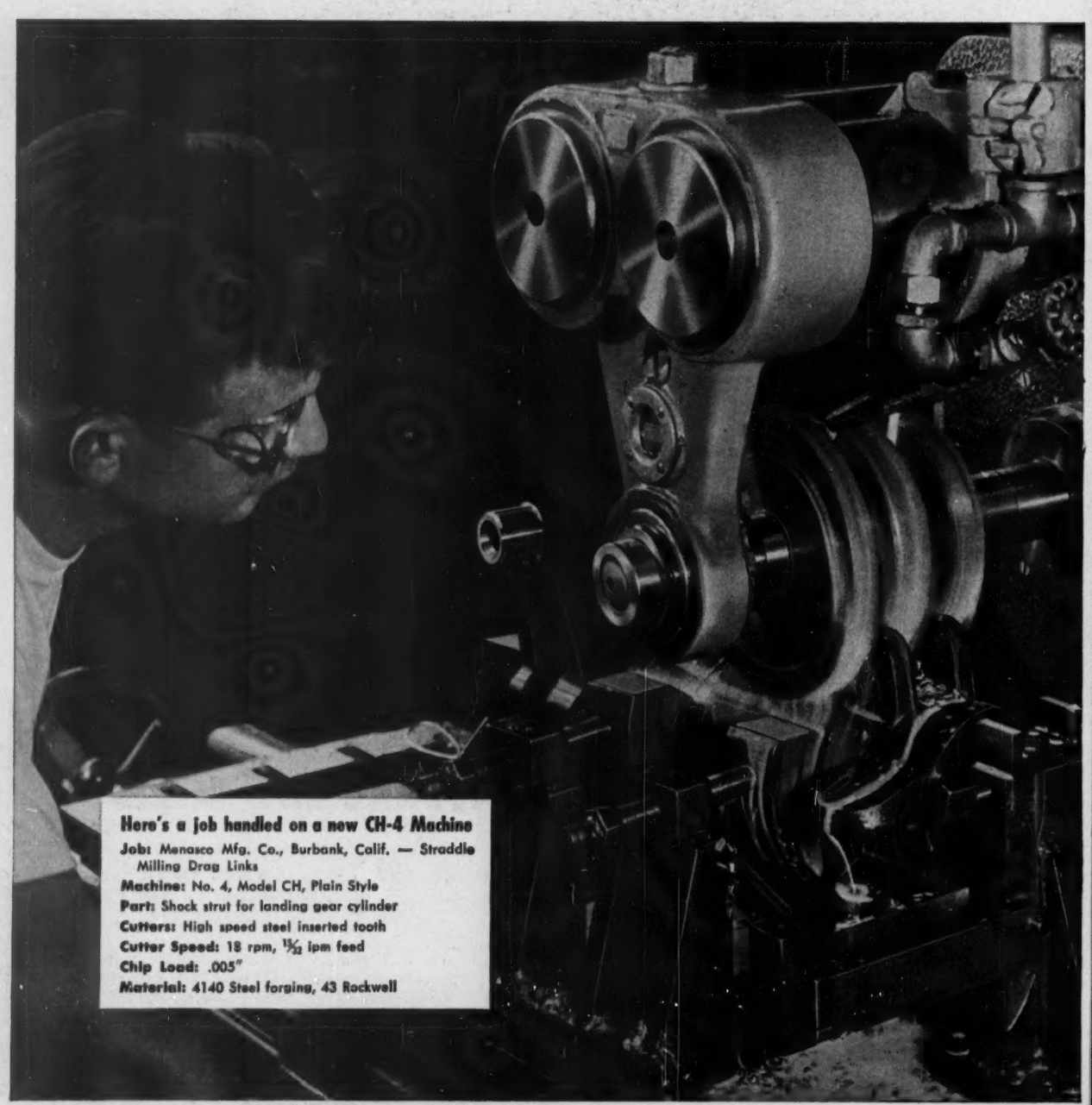


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CH MILLING SPEED, ACCURACY



Here's a job handled on a new CH-4 Machine

Job: Menasco Mfg. Co., Burbank, Calif. — Straddle Milling Drag Links

Machine: No. 4, Model CH, Plain Style

Part: Shock strut for landing gear cylinder

Cutters: High speed steel inserted tooth

Cutter Speed: 18 rpm, $1\frac{15}{32}$ ipm feed

Chip Load: .005"

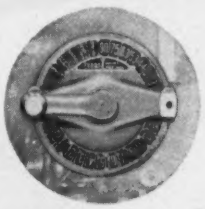
Material: 4140 Steel forging, 43 Rockwell

MACHINE COMBINES AND POWER

CH MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER



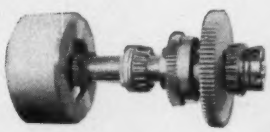
Speed range—*24* speed changes are provided from *15* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.



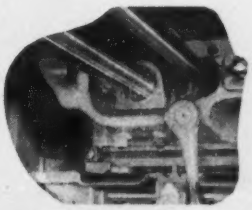
Extra wide feed range — *32* changes from ⅜" to *90"* per minute meet requirements of new metals and cutting tools for most efficient operation.



Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency through design refinements and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed for quiet operation.



Smoother feed performance through a heavy duty *2"* dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.



Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 15 hp delivered to spindle . . . *3* hp for feed and rapid traverse . . . ¼ hp for coolant.

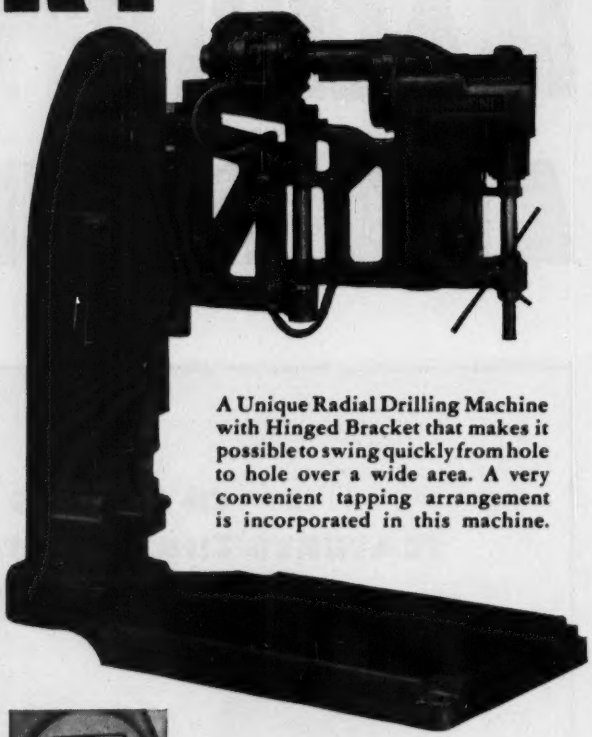
INVESTIGATE the new CH line of milling machines. These and other features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



FOOTBURT

machine tools for increased production

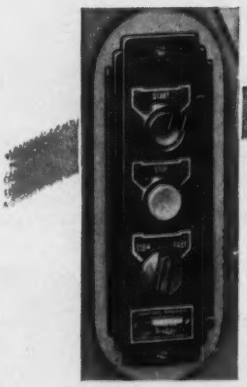
engineered for production



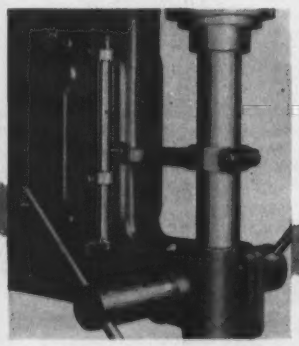
A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.

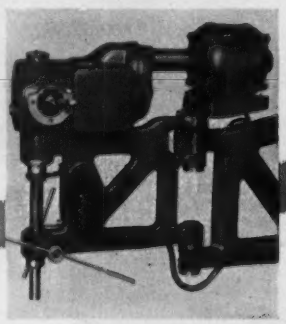
Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building









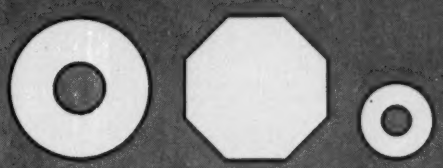
FOOTBURT

machine tools

GARDNER

precision disc **Grinders**

Grinding TWO Parallel Sides of 114 sq. in. Steel Disc In ONE Operation



WORK DATA

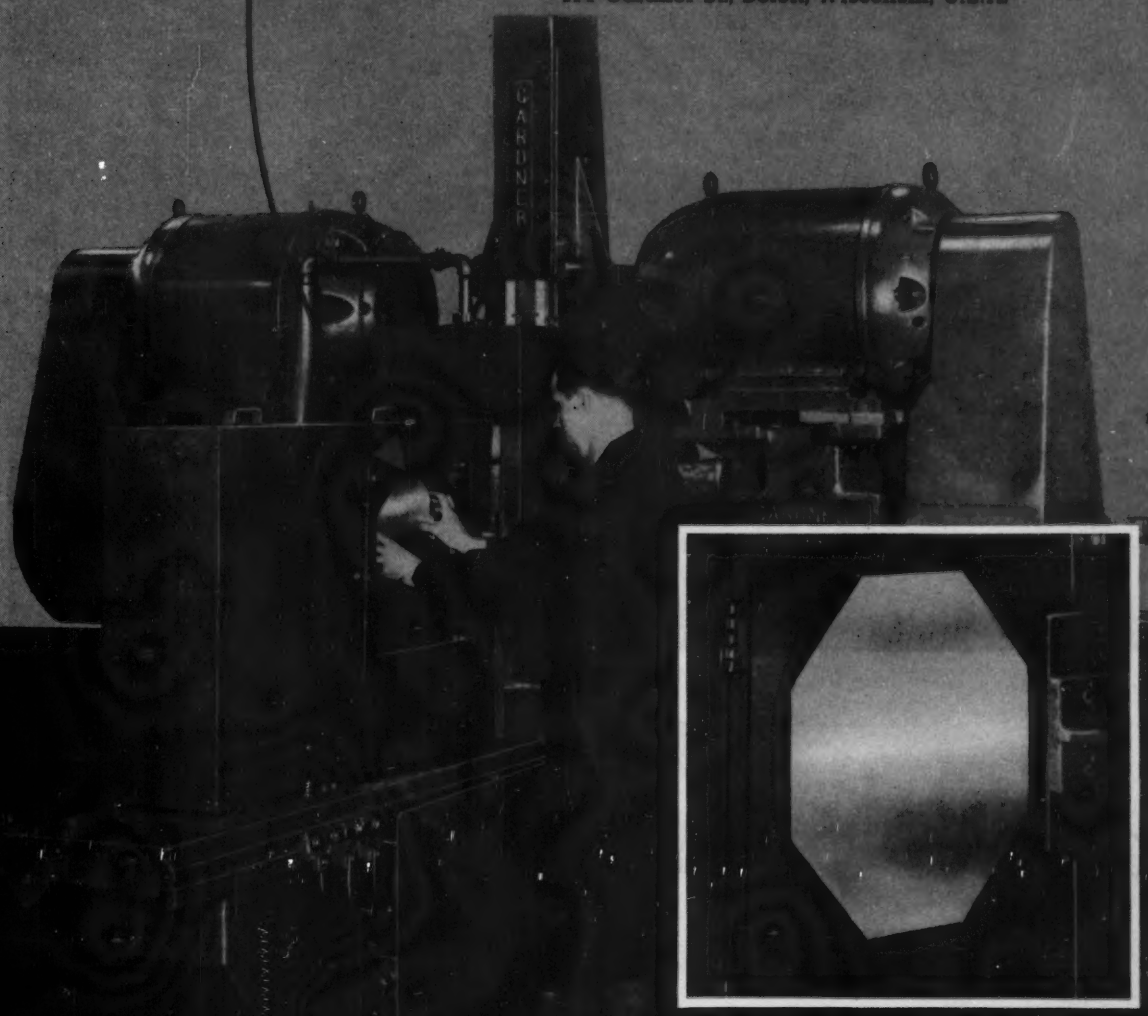
OPERATION—Grinding parallel sides of test billets to produce finished surface before etching for steel analysis.

STOCK REMOVAL—3/16" to 1/4" overall.

TOLERANCE—.006" to .008" for uniformity. .003" to .006" for parallelism.

Consult Gardner about your flat surfacing problems. Production estimates and tooling suggestions will be furnished from your work prints.

GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U.S.A.



114M

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really good enough, today?

Chances are good that if you've been using the same method for a mere two years, there's now a better way. That's how thick and fast the new developments in abrasive techniques have come along. Every day someone, somewhere, is switching from one method to another, under the pressure of one hard economic fact: the need to cut costs.

Here lies the biggest advantage to the shop which has standardized on abrasives by CARBORUNDUM. You get counsel free from bias, for the CARBORUNDUM distributor or salesman represents the only producer of a complete branded abrasives line, famous for uniform high quality. Thus he can recommend on the basis of what's most profitable for you, not just what's most profitable for him. And he can keep you posted on all the newest practices of metalworking shops from coast to coast.

Make a mental run-down today of each abrasive operation your shop performs, then call in the man from CARBORUNDUM for his experienced, practical, unbiased counsel. You'll find him listed in the yellow pages under "Abrasives." Call him today—it's to your profit!





Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

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offers ALL abrasive products...to give you the proper ONE

Get the most out of your

LELAND-GIFFORD

DRILLING MACHINES

MEMBER



LUBRICATE AS INSTRUCTED

Like all fine machinery, your Leland-Gifford drilling machines deserve the best care — including proper lubrication. Over-oiling can be as harmful as neglecting to oil. Adopt a daily and weekly lubricating routine, always using moderation. Better still, follow the recommendations in your instruction manual.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

SAVE TIME — **CONTACT THE OFFICE NEAREST YOU**



LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Another Way CIMCOOL Makes Jobs Better

Look at Cimcool° from an operator's viewpoint. Then you'll readily understand why machinists are so enthusiastic about this radically new and different cutting fluid. It leaves no slippery film on shoes, floor, machine or work. It doesn't soil clothing or hands. It contains no skin irritants.

And look at some other reasons why machinists stand up and cheer when Cimcool's on the job: Can't smoke. Can't burn. Virtually eliminates rancidity and foul odors. Cools so fast that tools and chips actually stay cool to the touch. *And this revolutionary chemical emulsion does a better job.*

Any way you look at it, Cimcool is the biggest working improvement in years. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

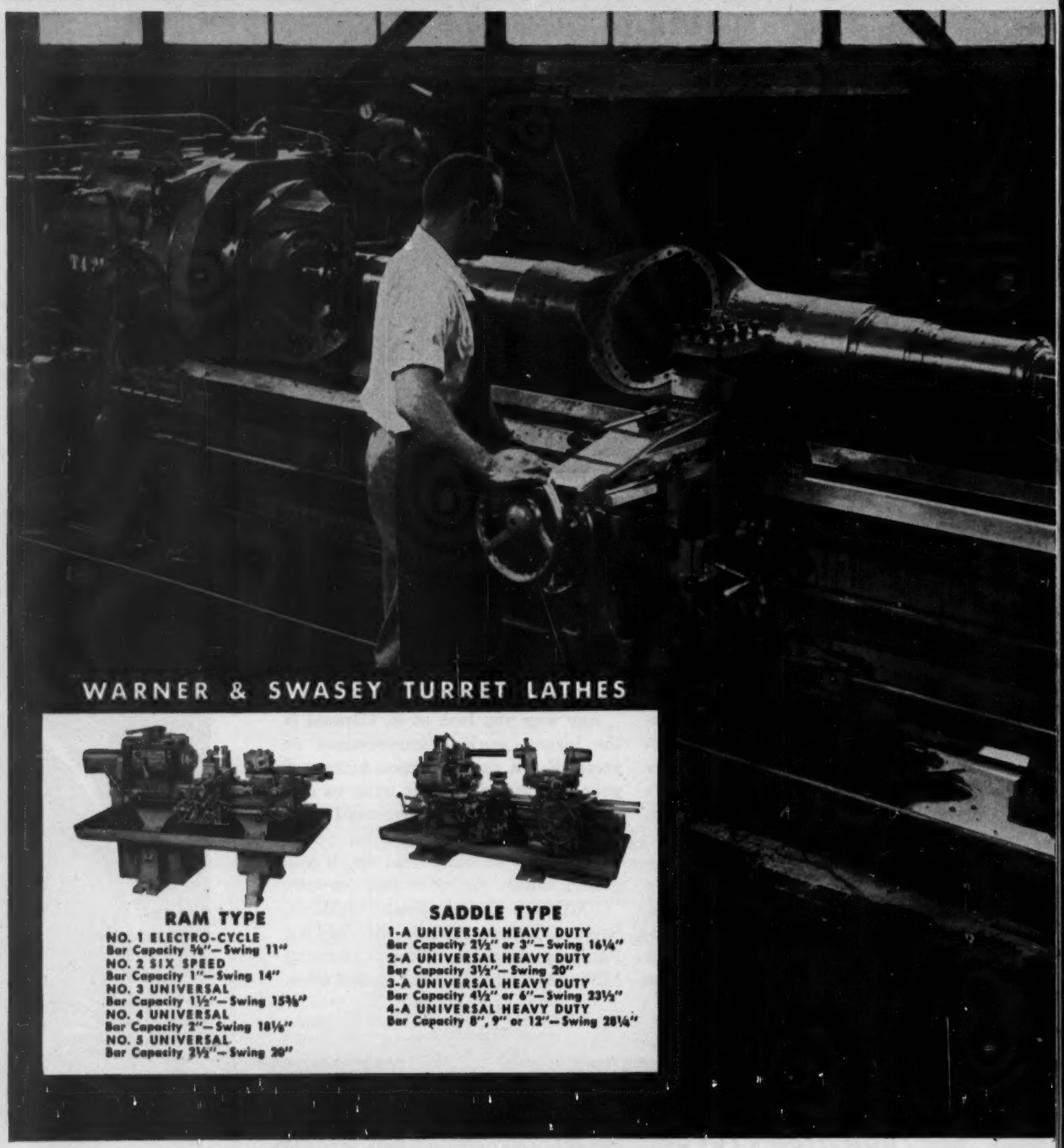
°Trade Mark Reg. U.S. Pat. Off.



A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85% OF ALL METAL CUTTING JOBS

"KING SIZE" OR



WARNER & SWASEY TURRET LATHES

RAM TYPE

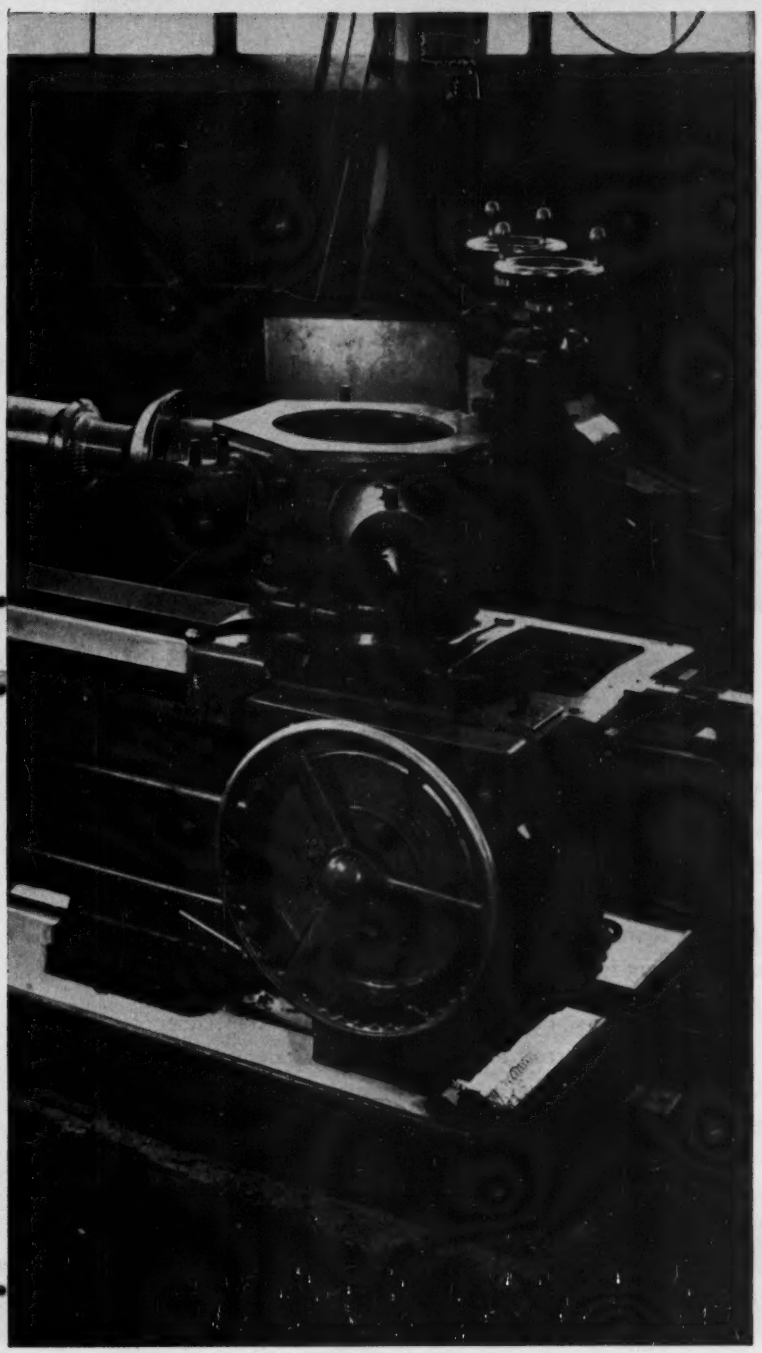
NO. 1 ELECTRO-CYCLE
Bar Capacity 5/8"—Swing 11"
NO. 2 SIX SPEED
Bar Capacity 1"—Swing 14"
NO. 3 UNIVERSAL
Bar Capacity 1½"—Swing 15⅜"
NO. 4 UNIVERSAL
Bar Capacity 2"—Swing 18⅛"
NO. 5 UNIVERSAL
Bar Capacity 2½"—Swing 20"

SADDLE TYPE

1-A UNIVERSAL HEAVY DUTY
Bar Capacity 2½" or 3"—Swing 16¼"
2-A UNIVERSAL HEAVY DUTY
Bar Capacity 3½"—Swing 20"
3-A UNIVERSAL HEAVY DUTY
Bar Capacity 4½" or 6"—Swing 23½"
4-A UNIVERSAL HEAVY DUTY
Bar Capacity 8", 9" or 12"—Swing 28¼"

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

"REGULAR" WARNER & SWASEY OFFERS BOTH



● This Warner & Swasey in the plant of a large road machinery builder is a good example of what we mean when we say Warner & Swasey Turret Lathes are built in sizes and capacities to handle all sorts of jobs. This machine, a 4-A Universal Heavy Duty Saddle Type Turret Lathe, has a bed six feet longer than standard in order to turn the "king size" rear axle housings used in the giant roadbuilding machinery. And tolerances of .001" are held on these large pieces.

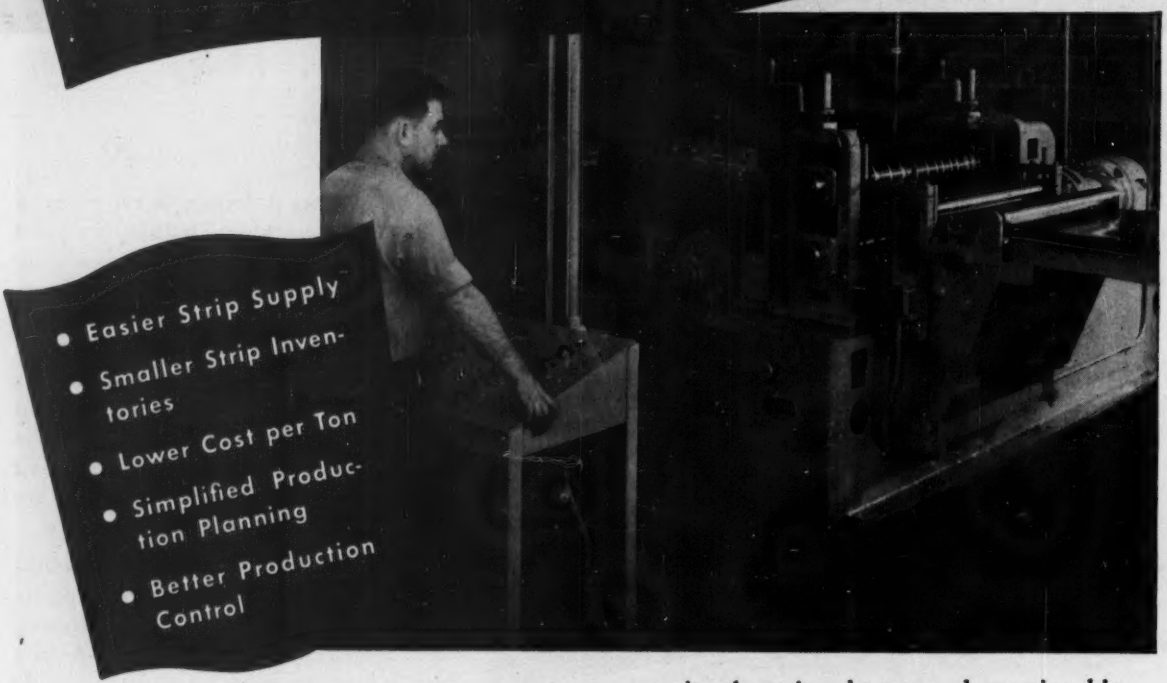
When you buy a Warner & Swasey—whether it's to handle the ⅛" bar capacity work of the No. 1 E-C, or jobs requiring the 12" bar capacity of the big 4-A—you buy a machine with an industry-wide reputation for ruggedness and extreme precision. It's a machine you can count on for high productivity, low upkeep, ease of operation, and dependability in holding its built-in accuracy for many years ahead.

So whenever you have a turning problem, call in your nearest Warner & Swasey Field Representative. He'll work with you and recommend the right machine for your range of work.

WARNER & SWASEY
Cleveland

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

YODER *Multiple Rotary* SLITTERS



- Easier Strip Supply
- Smaller Strip Inventories
- Lower Cost per Ton
- Simplified Production Planning
- Better Production Control

IF YOU USE over 100 tons of coiled strip per month, in strands of different widths, you will find a Yoder slitter a most profitable production tool. In times when materials are scarce, it eases your strip supply because you can buy standard widths from a greater number of sources of supply, and at a substantial saving in cost per ton. This saving alone soon pays for your investment.

Deliveries of standard widths are much quicker, avoiding the necessity for ordering long in advance and carrying big inventories of slit-to-width strands.

Consider the convenience of being able to supply your own needs in slit strands, on a few hours' notice, from a relatively small stock of standard width coils. It simplifies production planning, removes a source of constant worry in times of scarcity.

Yoder makes a complete line of rotary slitters for sheets and coils, including coil boxes, uncoilers, recoilers, scrap choppers, coil handling cars, etc. Yoder slitter book is a treatise on the economics of doing your own slitting. Ask for it.

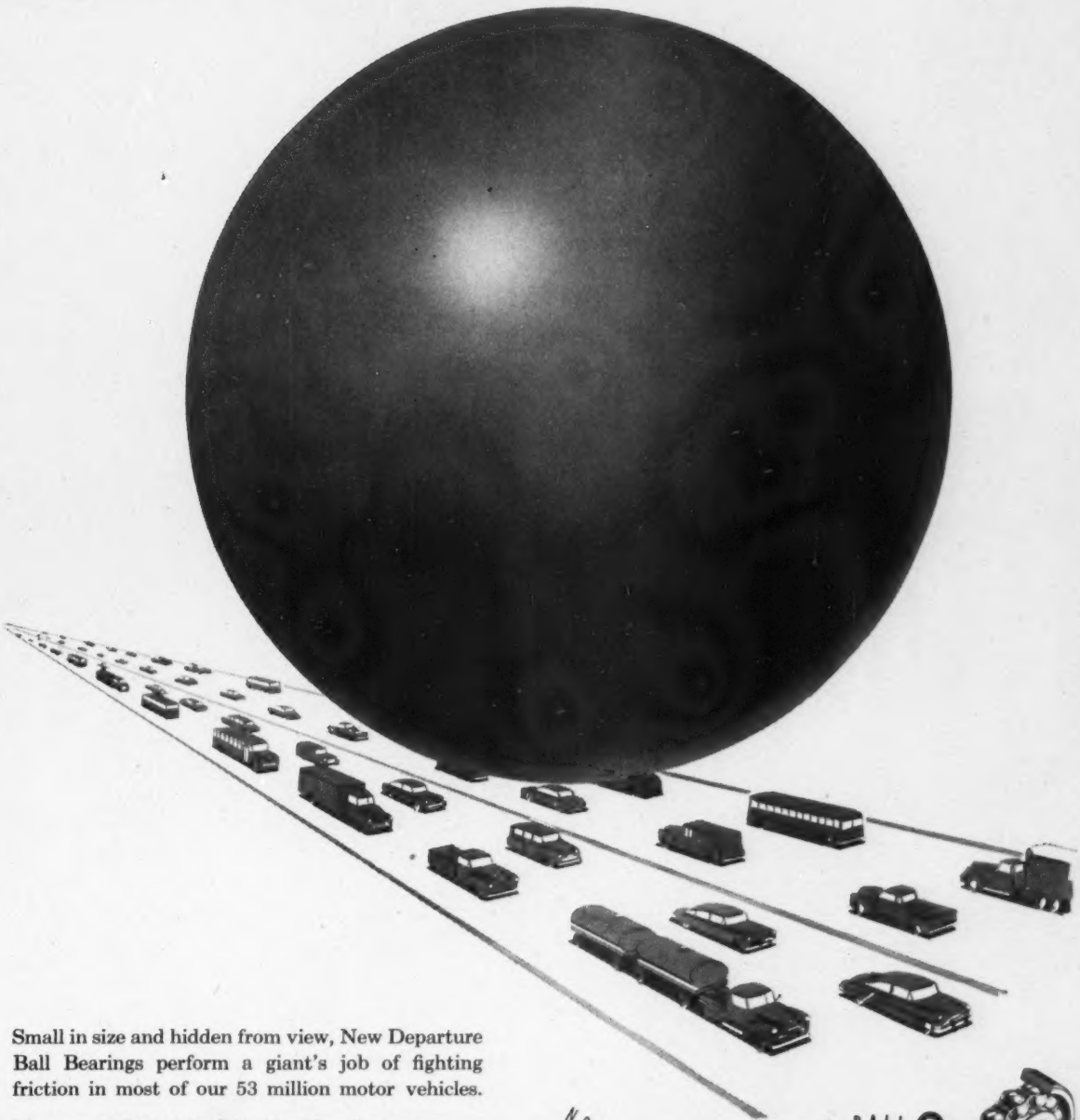
THE YODER COMPANY • 5504 Walworth Avenue, Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding

ENGINEERING YODER MANUFACTURING

Little Giant of the highway



Small in size and hidden from view, New Departure Ball Bearings perform a giant's job of fighting friction in most of our 53 million motor vehicles.

Many are "Sealed-for-Life" by New Departure . . . installed on fan and water pump shafts, propeller shafts, transmissions and rear wheels. With dirt sealed out and lubricant sealed in, they provide longer wear with less care. N-D-Seal bearings also simplify product design and reduce maintenance.

Through its resources of research . . . its engineering excellence . . . its precision production . . . New Departure is the recognized leader. Keep your eye on the BALL to be sure of your BEARINGS!

NOTHING ROLLS LIKE A BALL



NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT



PREFORM



PIERCE, TRIM AND BLANK



EDGE

Here's what you can do by

Hydroforming

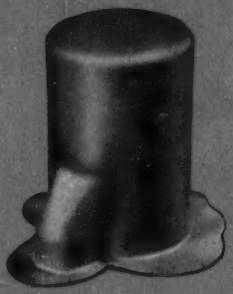


HOLD CLOSE TOLERANCES



SANDWICH

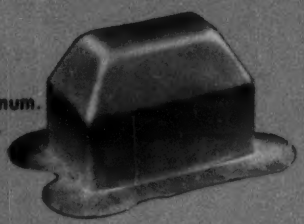
Cover of 0.064" 2SO Aluminum. Hydroformed in 2 operations.

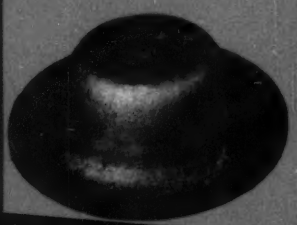




Strainer of 20 gage perforated cold rolled steel. Hydroformed in 1 operation.

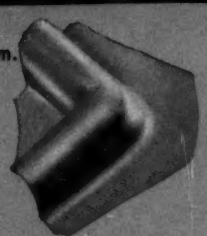
Cover of 0.040" 3SO Aluminum. Hydroformed in 1 operation.





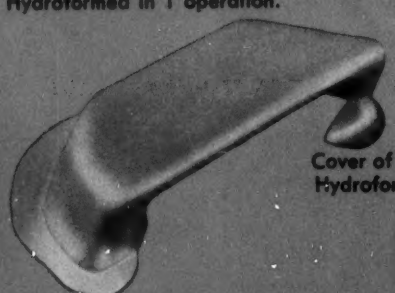
Cap of ⅜" cold rolled steel. Hydroformed in 1 operation.

Angle assembly of 0.075" Aluminum. Hydroformed in 1 operation.





Aircraft detail of 0.040" Aluminum. Hydroformed in 1 operation.



Cover of 0.032" Aluminum. Hydroformed in 1 operation.



Vessel of ¼" cold rolled steel. Hydroformed in 1 operation.

PRODUCE DEEP DRAWN PARTS WITH VERY FEW LIMITATIONS AS TO SHAPE

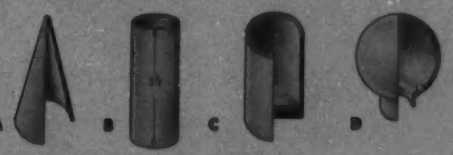
Hydroforming has revolutionized deep drawing. The parts and forming operations illustrated on the opposite page show the extreme versatility of this process. Note the wide variations in part shape. Note, too, that Hydroforming is *not* confined simply to the production of round or symmetrical parts.

WORK WITH A WIDE RANGE OF MATERIALS

Parts can be Hydroformed of steel, aluminum, magnesium, copper, aluminized steel, brass, plastics, insulating materials and precious metals. High-strength alloys successfully Hydroformed include titanium, Inconel, Nimonic 75, L-605, stainless steels, stainless-clad copper.

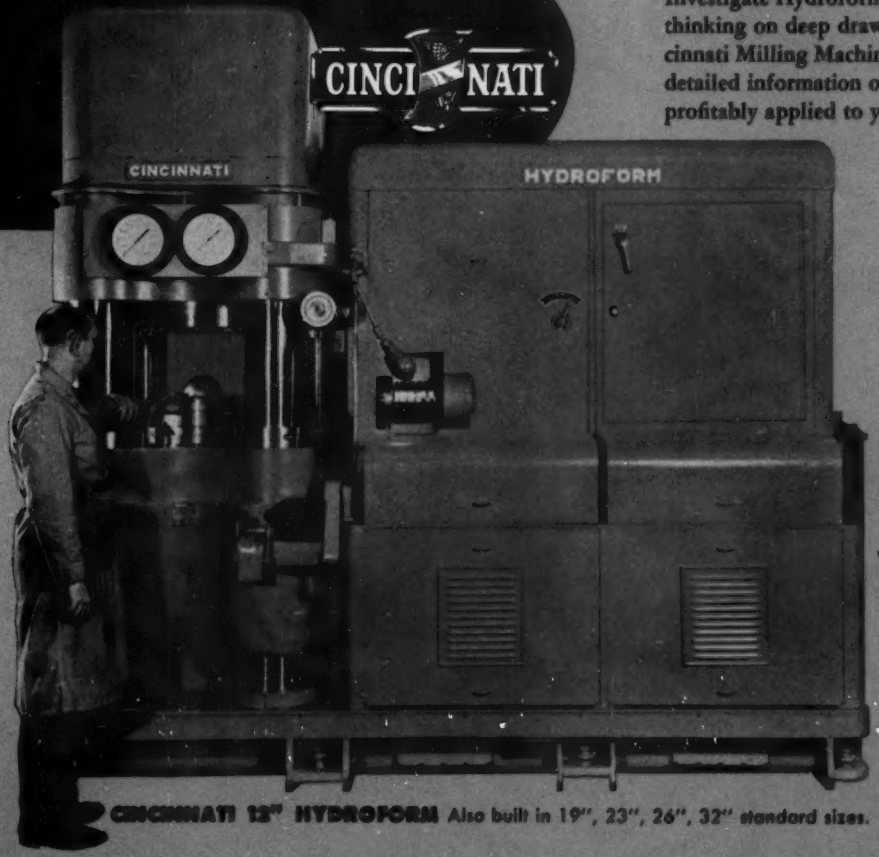
Blank thickness can range from foils to 3/8" mild steel. Blanks ranging up to 32" maximum diameter can be drawn in standard machines. Larger equipment available on application.

There are several basic shapes that cannot be practically Hydroformed. It is not practical to form sharp, pointed conical shapes (Fig. A). Straight-walled cup shapes having a depth to diameter ratio of 2½ or more to 1 are not practical to form (Fig. B). Parts similar to shell castings which have a relatively thin wall as compared to a thicker closed end cannot be Hydroformed (Fig. C). Bulged parts having a small opening are impractical to form. Parts of this type with a large opening can be made using a segmented punch for removal after forming (Fig. D).



With the few exceptions noted above, practically *any shape* can be Hydroformed. In addition, Hydroforming brings to industry many other benefits affecting the time and cost of producing deep drawn parts. Only simple, low-cost tooling is required. Most parts are produced in a single draw. Part quality is materially improved. Surface finish is unimpaired.

Investigate Hydroforming now. It will change your thinking on deep drawing and forming. Let a Cincinnati Milling Machine Co. field engineer give you detailed information on how Hydroforming can be profitably applied to your production.





Write for your copy of Hydroform Bulletin M-1759

CINCINNATI 12" HYDROFORM Also built in 19", 23", 26", 32" standard sizes.

Hydroform

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO

Why accept this?... when you actually want this?...



CARMET blanks are preformed to your order!

GET THE NEW CARMET CATALOG

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. ● *Write for your copy.*

ADDRESS DEPT. M-36

Above are shown two carbide metal rolls of identical composition. The one at the left cost the user about nine times as much as the one at the right. That differential was due solely to grinding vs. non-grinding. The plain face needed serrating, whereas the ready-toothed face needed nothing.

In many uses where tolerances are not too critical, CARMET blanks *preformed* to your specifications are ready for service without additional costly grinding. On jobs where finish grinding is necessary, the quality of Carmet's preforming holds grinding stock to a minimum.

Hundreds of special shapes can be preformed in Carmet. For practical suggestions that fit your needs, call or write your nearest A-L representative. ● *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 4048

AL FINE TOOL STEELS SINCE 1854

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

COST-SAVING SETUP FOR MACHINING BOTH ENDS AT ONCE

Shows Value of Proper Tool Planning with Versatile Lathe

You can see real thinking has gone into this setup for machining tractor rear axle housings. As the result, this Simplimatic Automatic Lathe is simultaneously machining the two end flanges in a single, fast operation.

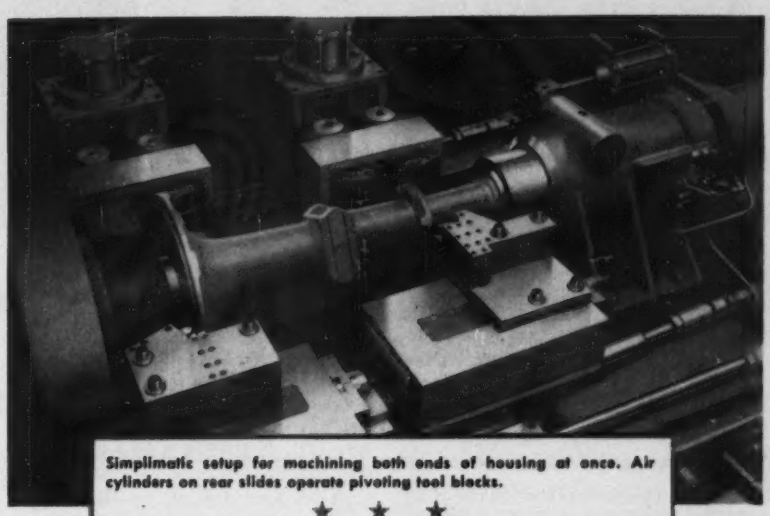
Work is divided between the four slides. All turning and some chamfering are done by the two front slides. The two rear slides take care of the straddle facing . . . doing it in an extremely clever way. Each of these rear slides consists of a pair of pivoted tool blocks which have a scissors-like action.

Tool Blocks have Two Sections

The two *right* rear tool blocks are tightly wedged together at the start of the cut. When straddle facing is completed they spring apart, providing tool relief for the withdrawal.

There's a different action to the two *left* rear tool blocks. Here, the tool blocks are partially wedged together as the slide feeds the tools into the work. As the slide continues to feed forward, the straddle facing tools are brought closer together. This splits the wide facing cut among three tools. At the completion of the cut, the tools spring apart for tool relief. Floor-to-floor time for the entire automatic operation is 1.33 minutes.

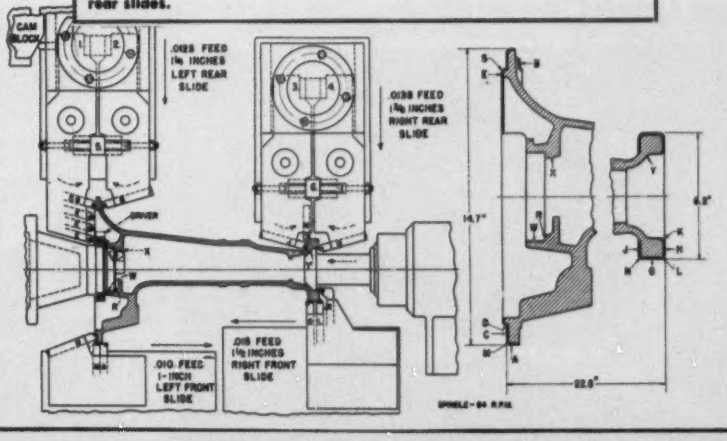
Pivoting tool blocks on this Simplimatic job provide the answer for machining both flanges in a single operation.



Simplimatic setup for machining both ends of housing at once. Air cylinders on rear slides operate pivoting tool blocks.

★ ★ ★

Tooling layout for axle housings. Note action of divided tool blocks on rear slides.



Other interesting jobs . . . handled on the Simplimatic Automatic Lathe, plus full information and specifications are yours in the all new Simplimatic catalog just off the press. Ask for your copy.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE TURNS OUT PARTS IN PAIRS

Tooling Arranged for Handling Related Parts with One Setup

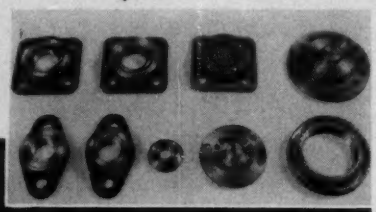
Here's a 1F Fastermatic Automatic Turret Lathe specializing in the production of a wide assortment of mating parts. The steel forgings are handled in lots of 200 pieces—100 male and 100 female parts.

Simple tooling takes care of the simple operations involved. Just two faces of the hexagon turret are needed for each part . . . but the handling of alternate male and female parts keeps four turret stations busy.

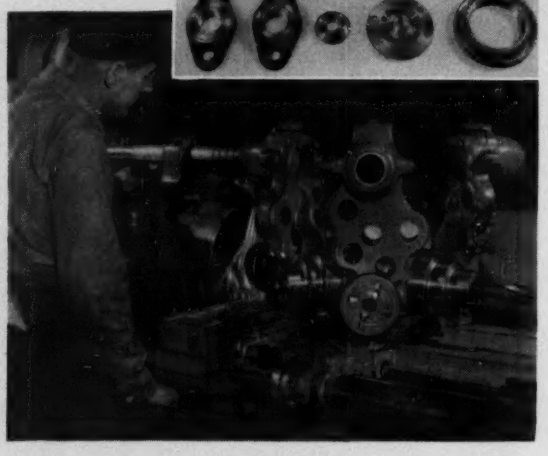
The photo shows a male flange being formed. This is followed by a drilling operation. After that, the operator removes the male flange and chucks a female flange (using same chuck jaws). Passing the next turret face, work is then begun on this flange. From stations four and five the female flange is drilled and faced. Turret station six is then passed and the operation is complete . . . and a male flange is again handled.

The nice feature of this setup is that with one set of tools on the machine, you complete *two* mating parts. This way you're always sure the parts will match perfectly. Moreover, since alternate pieces are machined, there's no problem in keeping quantities even. Total time for a pair of these parts is an even 5 minutes.

Typical parts handled in pairs on the Fastermatic.



Small parts, even in small lots, are economically produced in pairs by the Fastermatic Automatic Lathe.



Male flange being formed. After next drilling operation, female flange is machined. Then male flange again.

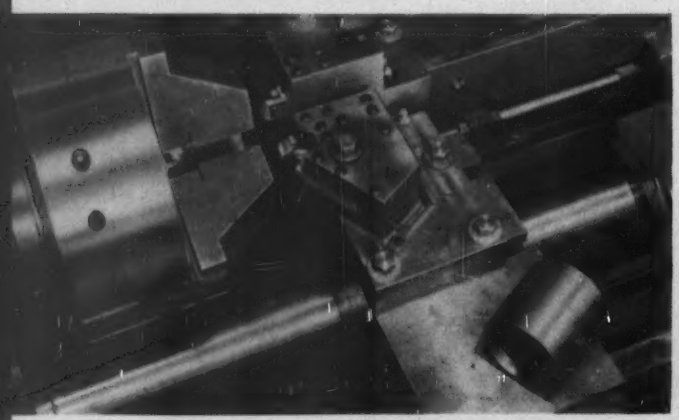
PISTONS BORED AND CENTERED IN 1ST OPERATION

No. 12 Hydraulic Automatic Lathe Combines Machining of Skirt and Centering of Dome

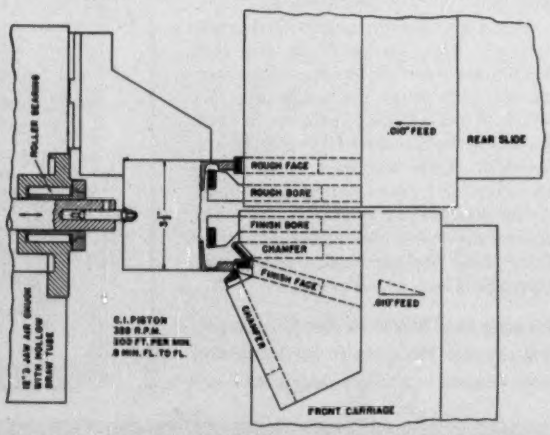
The main operations are on the skirt end of this cast iron tractor piston. The rear slide feeding longitudinally rough bores and faces the skirt. As this slide withdraws, the front carriage moves longitudinally to finish bore and chamfer the ID. It then swings in to finish face and chamfer the OD. It is then withdrawn from the position to provide tool relief.

After operations on the piston skirt, the No. 12 Hydraulic completes its job by centering the piston dome. This is handled by the back boring attachment in the spindle. Floor to floor time is .8 minute. Several sizes of pistons are handled by this No. 12 Hydraulic, all with fully automatic operation.

Combining boring of skirt and centering of dome saves time and provides complete concentricity for following machining operations.



Close up of Tooling for boring and facing skirt end of piston and centering dome end.



Cast iron tractor piston job on the No. 12 Hydraulic Automatic Lathe.

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LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT

GISHOLT

TIME-SAVING IDEAS

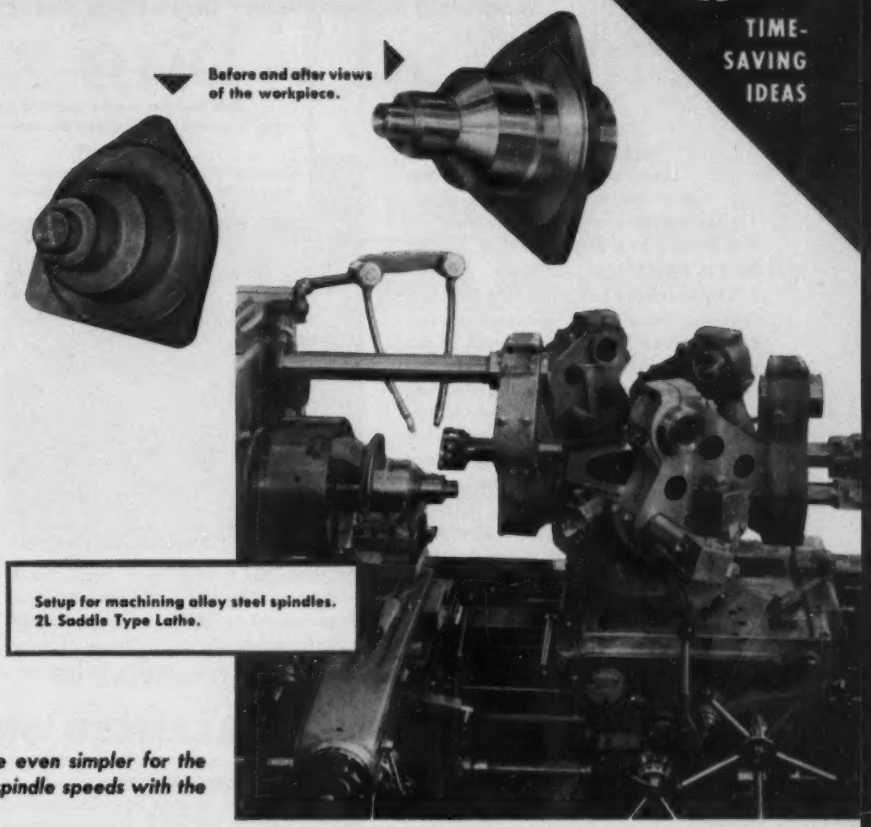
EASY DOES IT...WITH A 6-SPEED CHANGE OF PACE

Saddle Type Turret Lathe Cuts Time Lag with Speed Selector

While the operations needed to finish these spindles are all relatively simple, the job could be a trouble-maker on a less able machine than this 2L Saddle Type Turret Lathe.

Here's why: The part's a tough steel forging weighing in at 103 lbs. and finishing at 93 lbs. Not much stock removed, to be sure, but it takes carbide to do it. The workpiece is chucked on the previously turned short rear hub with a standard 3-jaw airchuck to speed up handling. Standard tools are used to finish all twelve outside diameters.

With the many diameters to be machined on the part, six different spindle speeds are required . . . an easy matter for the Gisholt with its Hydraulic Speed Selector which gives instant, accurate speed changes. Floor-to-floor time for these husky parts is an easy 14.5 minutes.



Before and after views of the workpiece.

Setup for machining alloy steel spindles. 2L Saddle Type Lathe.

Simple operations on these parts are made even simpler for the operator because of the ease of changing spindle speeds with the Gisholt Hydraulic Speed Selector.

A LITTLE EXTRA TOOLING—A LOT OF EXTRA PRODUCTION

Ram Type Turret Lathe Completes Pulleys in Single Chucking

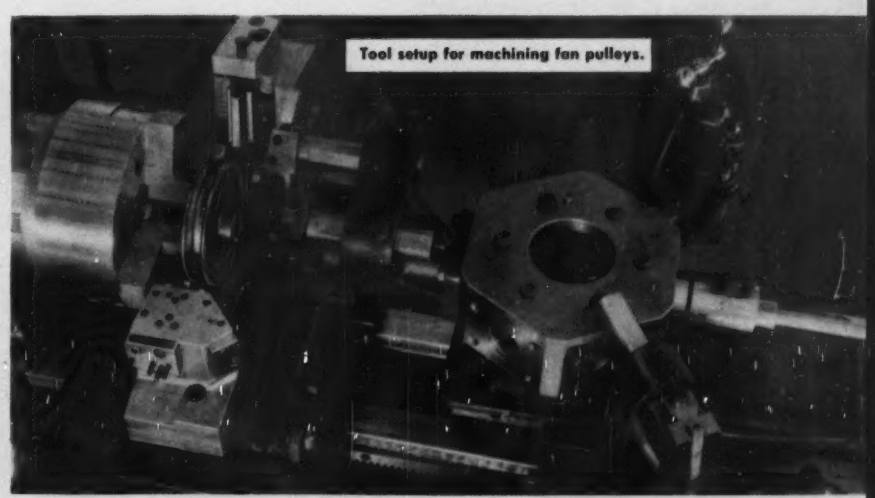
Here's another example of where careful attention to tooling is paying off in increased production. The part is a V-belt pulley and the machine is a standard No. 3 Ram Type Turret Lathe.

The part is held in special top jaws on a standard Gisholt 3-jaw scroll chuck. All boring, turning and facing of the hub are handled by multiple tooling on three faces of the hexagon turret. The large OD is also turned from here.

Special tools are used on the cross slide. In place of the standard quick-indexing tool post on the front of the slide, there is a special tool block. These tools not only rough out the groove, but straddle face the sides as well.

On the rear of the cross slide is another special tool block. Tools here finish-form the groove and finish-straddle face the flanges.

By using special tool blocks on both the front and rear of the cross slide, all machining on these pulleys is done in one chucking.



Tool setup for machining fan pulleys.

GISHOLT

TIME-SAVING IDEAS

TAKING THE TROUBLE OUT OF TAPPETS ... WITH SUPERFINISH

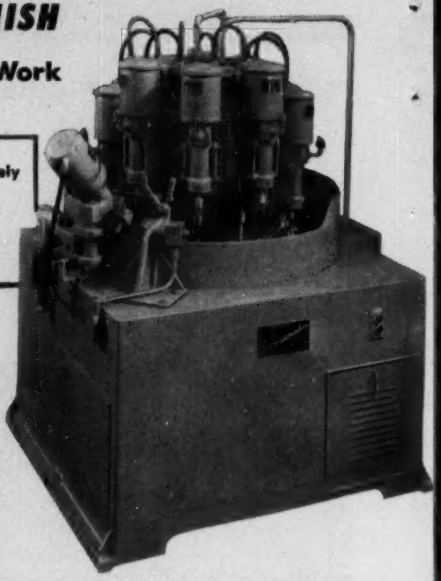
9 Spindle Superfinisher Does High Volume Work

Here's another forward step for extending and improving engine performance. This time it's valve tappets that are being Superfinished. Doing this high production job is a Model 53A Superfinisher. Here's how it operates:

The machine has nine spindles in a rotating base. This operates continuously, like a "merry-go-round." Each work spindle has a collet to hold the tappet. Above is a Superfinishing head. Collets and heads rotate in opposite directions. During the machine cycle the flat Superfinishing stones scrub off the amorphous metal on the cam surface of each tappet.

Superfinishing complete, the head is raised and an angular head comes in to chamfer the corners. Then, as the spindle returns to the unloading position, rotating stops, the collet opens, and the tappet is partially ejected. The operator then takes out the finished tappet and replaces it with an unfinished tappet. Production is 600 to 800 parts per hour.

Superfinishing is solving "wearing" problems in many industries.



Superfinisher produces 600 to 800 finely finished valve tappets per hour.

★ ★ ★



Close-up showing special Superfinishing unit for chamfering OD of tappets.

The textbook *"Wear and Surface Finish"* gives the complete story. Ask for your copy.

Better, longer lasting valve tappets are produced in this high production Superfinishing setup.

FLYWHEELS IN ALL SIZES BALANCED ON THIS ONE MACHINE

Handled on Efficient Production Basis

Here is the way flywheels in a large variety of sizes are balanced by a well known engine manufacturer. A Gisholt DYNETRIC Type UV1 Balancing Machine takes care of all production, with parts weighing from 25 to 400 lbs.

A roller and guide arrangement, adjustable to handle flywheels from 8½" to 32", carries the flywheels from the assembly line to the machine and back. As the flywheel is located in position on the Balancer, a hydraulically operated mechanism raises it from the rollers for support by the spindle.

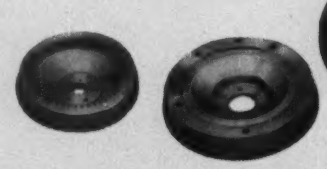
After the quick balancing operation is completed, the flywheel is turned to the indicated angle of unbalance. A sliding prick-punch, which can be set at any radius from 4" to 16" from true center, is then moved to the proper location and activated to mark the spot on the flywheel bottom where drilling correction is made.

This balancing operation, which is part of assembly line operations, results in smoother engine performance, less engine vibration.

DYNETRIC BALANCERS



Type UV1 Balancer for balancing tractor engine flywheels.



A few of the many sizes of flywheels balanced.

No 11-1252

603

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

How

"The Fox and The Stork"

points a moral to Cutting Fluid users



. . . with apologies to Aesop

The Fox was playing host to the Stork at dinner. Being a great prankster, he served nothing but soup in shallow dishes. The poor Stork got nothing to eat because he could get only the tip of his long bill into the soup.

The Stork reciprocated by having the Fox to a dinner at which he served delicious rice in long thin-necked jars. This time the Fox went without food because he couldn't even get his nose into the jar!

THE MORAL:

Like the Fox and the Stork in Aesop's fable, each cutting fluid has its own capabilities. When put on an application for which it is not suited the cutting fluid fails to give you the production, tool life or finish possible.

Stuart offers you a vast background of experience in the *selection and application* of cutting fluids, both water-mixed and straight oil types and has the cutting fluids to best meet your requirements. Ask to have a Stuart Representative demonstrate how proper selection and application of cutting fluids saves time, money and materials. Be sure to ask him for the booklet "More Than a Coolant Is Needed."

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

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Free! Dilut-o-graph

Circular slide rule makes dilution of cutting fluids quick, easy! For tanks of 1 to 100 gallons. Fill in coupon, clip to your company letterhead and mail to:

D. A. STUART OIL CO.
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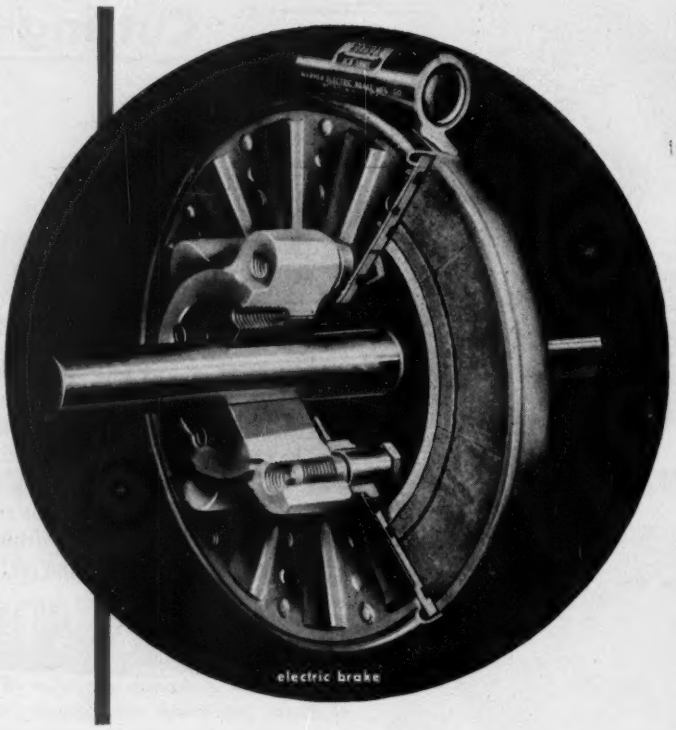
Name .....

Title .....

Warner Electric Brake stops LeBlond lathe in less than a second... saves wear and tear on the motor

WARNER
electric motion control

- **stops spindle smoothly in less than a second**
- **saves wear and tear on motor**
- **speeds operation—saves time and motion**
- **wears longer—requires less servicing**
- **cuts manufacturing costs—few parts to assemble**



How fast can a brake get? Less than a second is what it takes to stop the high speed LeBlond lathe. That's a second of smooth, gradual deceleration—there's no grab or shock—because Warner Electric Brakes give you precisely controlled application of speed and power.

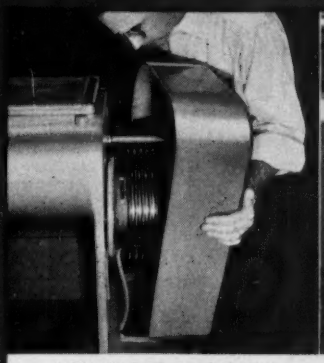
By speeding operation of this machine, Warner Electric Brakes save operator time and increase his productivity on long or short run turning. Convenient two-station electric spindle control provides simple, efficient operation, minimizing fatigue, particularly on long-bed machines. Former tendency to stop spindle by reversing the motor has been eliminated. The motor lasts longer. Brake lasts longer too, because it dissipates heat so rapidly. Added to these improvements are definite sales and manufacturing advantages. Brake is easily and economically assembled on the drive shaft. Since it lasts longer and has fewer parts . . . little, or no factory servicing is required.

Numerous stop-start problems are efficiently solved by Warner *electric motion control.* Improvements have been made, too, on applications controlling speed, tensioning, positioning, coupling, indexing and rapid cycling. Your Warner representative will gladly demonstrate . . . see coupon below.

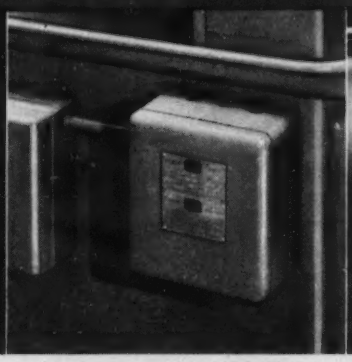
WARNER

ELECTRIC BRAKES & CLUTCHES

FOR INDUSTRIAL APPLICATIONS



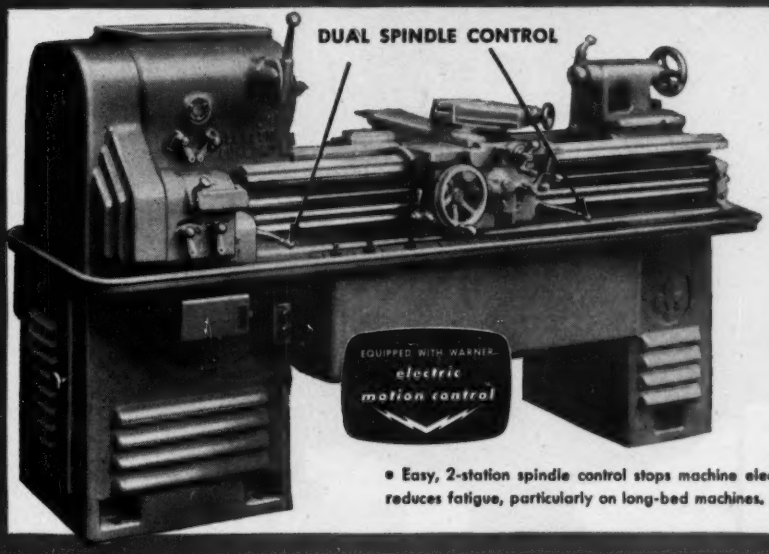
• Electric brake and drive pulley are mounted compactly to main drive shaft.



• Warner control provides efficient braking circuit and rheostat for precise adjustment of torque and speed.



• Brake magnet is mounted to headstock casting. Mating armature is mounted on drive pins to inside of pulley. Simplicity cuts assembly costs.

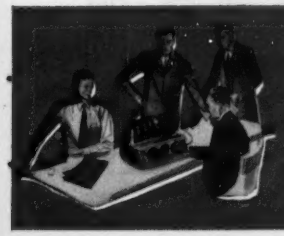


• Warner Electric Brakes are standard equipment on Regal Lathes, Dual Drive Lathes, Hollow Spindle Lathes and Turbine Lathes manufactured by the R. K. LeBlond Machine Tool Company, Cincinnati, Ohio. These machines are precision tools, for high production metalworking operations. Rapid, easily controlled stops and starts eliminate unproductive machine time . . . there is no coasting or waiting . . . loading and unloading is fast. Apron spindle control is simplified by electric brake principle.

• Easy, 2-station spindle control stops machine electrically . . . saves operator's time and reduces fatigue, particularly on long-bed machines.

Warner Electric Brakes, Clutches and Clutch-Brakes give you new, unique simplicity of design and operation. There are only two main parts, an armature and magnet. Operation is by *electro-magnetic*, instantaneous engagement and release of friction surfaces. Torque ratings are extremely high for small size and light weight. No coasting or slipping when "locked in." Easily designed into original equipment. Readily adapted to automatic cycles and remote control by limit switches, relays, electric-eyes, pushbuttons, etc. Rate of application accurately controlled to synchronize motions—give exact degree of speed and power required for your machine operation.

CONTROL ENGINEERING SERVICE . . . Warner offers complete application and control engineering service and field assistance. If you have a clutching, braking, tensioning, indexing or speed control problem, consult competent, experienced Warner brake and clutch specialists for reliable recommendations on torque, heat, electrical controls, capacity, etc.



FREE DEMONSTRATION

Test the high torque, instant speed and ease of control of electric brakes and clutches right on your desk top. Paste coupon to letterhead or 2 cent postcard and call today for demonstration.

Warner Electric Brake & Clutch Co., Dept. M, Beloit, Wis. OUR 25th YEAR

☐ Please send your FREE Bulletin No. 703-A.

☐ Have your representative call to discuss my problem.

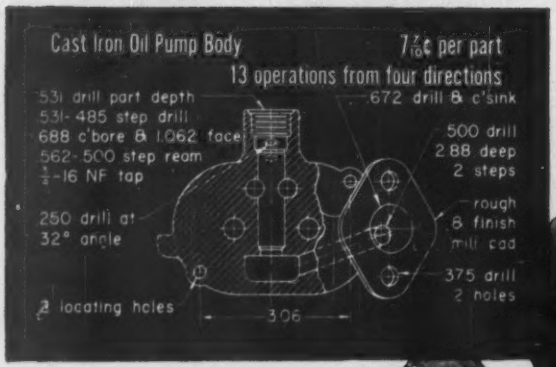
Firm Name_____

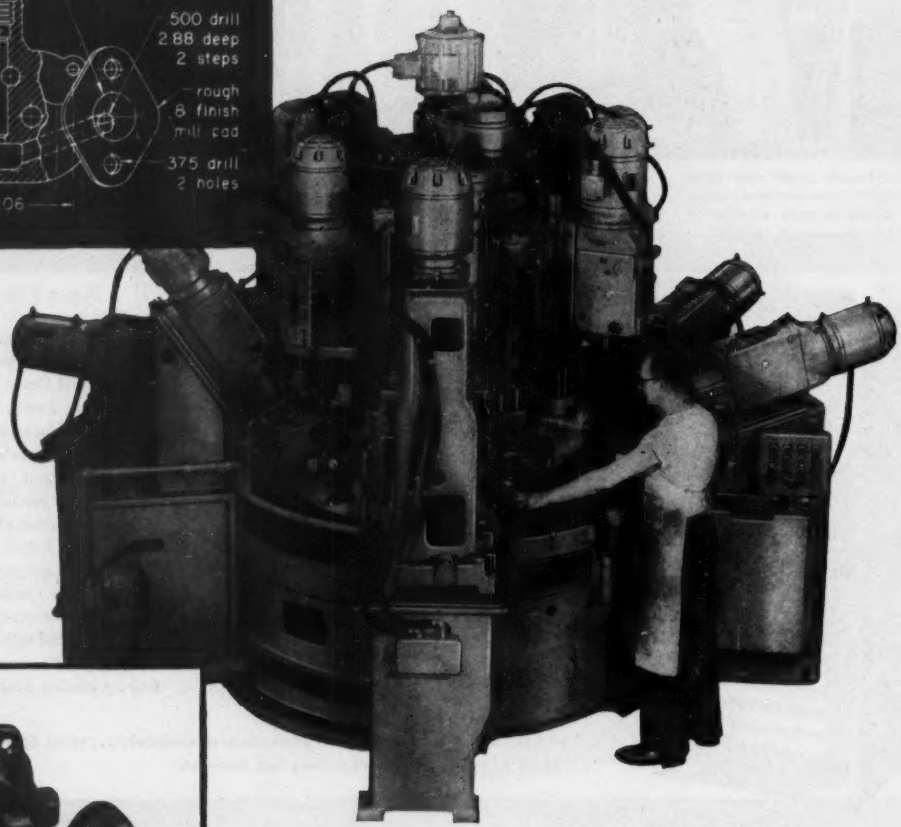
Individual_____ Title_____

Address_____

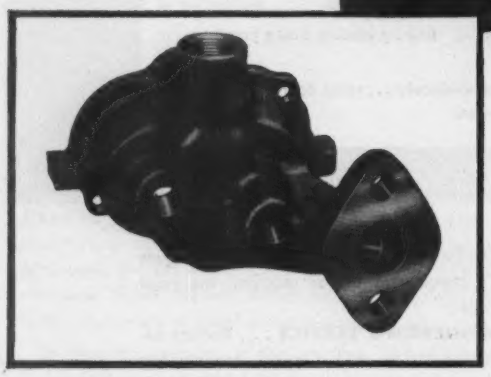
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More parts per man-hour soon





13 Operations from 4 Directions 7 7/10¢ per part



Production is 200 parts per hour gross.

KINGSBURY Special Purpose Drilling and Tapping Machine Combines Operations to Save Money

Dear Sir:

Look at this Cast Iron Oil Pump Body. How many machines would *you* need to do all this work? One central column Kingsbury with an 84-inch base and 60-inch index table does all 13 operations. It has ten stations with 11 drilling units and one tapping unit. One unit has a two-spindle auxiliary head. Six units are mounted vertically. The other six units are mounted on knees bolted to the base and these are mounted at three different angles to the work.

The longest single operation governs the time required to finish one piece. By splitting a long operation into two short ones, using two units, the time cycle can be cut. Thus the .500 hole is drilled in two steps.

Bushing carriers guide all tools except the tap, the milling cutters and the second .500 drill. This means accurate alignment and precise positioning from the locating point. An interesting operation is the finish milling operation which has a special mechanism that draws the cutter away from the work on the up stroke. No tool marks to mar the finish.

pay for a KINGSBURY

Designed to Produce One Part

Kingsbury Machines are designed for low production costs on long runs of parts requiring several operations. The more operations at one setup, the greater are the savings possible. But these machines pay for themselves on simple work too. For example, the Steel Bearing Race shown at the lower left requires only a few operations. The Kingsbury machine soon paid for itself with more parts per man-hour at greater accuracy.

Each machine is equipped with ½ to 5 hp automatic units. The number of units and the type of work holders depend on the work to be done. The work table may be stationary or it may be indexed. Your Kingsbury will come to you ready to run.

How Unit Costs were Figured

Each unit cost shown is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly rate}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

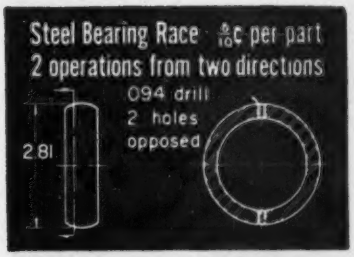
The unit cost of the machine:

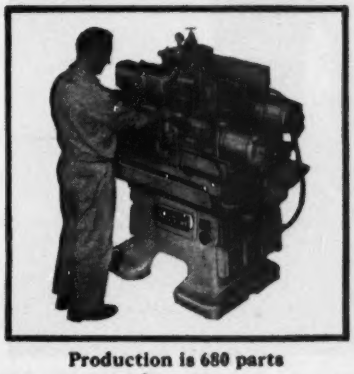
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

The costs include just the man and the machine — no power or overhead. As to the 6000 hours, that's about three years for one shift — one year for three shifts.

If you want more information just drop us a line.

Sincerely,
Kingsbury Machine Tool Corp.
99 Laurel St., Keene, N. H.





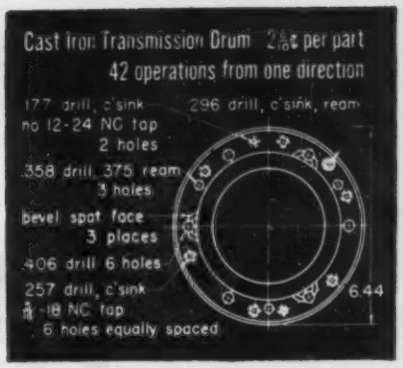
Production is 680 parts per hour gross.

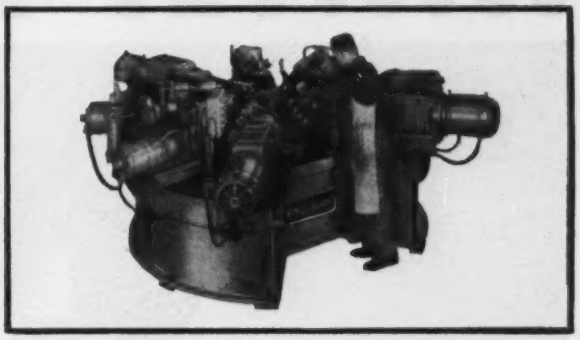


← Steel Bearing Race

2 Operations—from 2 Directions .6/10¢ per part

The machine on the left looks simple, doesn't it? It is, but it really produces. The operator of this double end machine puts in one piece and trips a lever. Air cylinders clamp the work and opposed units drill .094. While they are operating he loads another part into the rear fixture. With two fixtures, the operator can load one while the other is working — no waiting for operations to be completed. There's no indexing, just a 46 by 24 inch rectangular table.





Production is 330 parts per hour gross.

↑ Cast Iron Transmission Drum

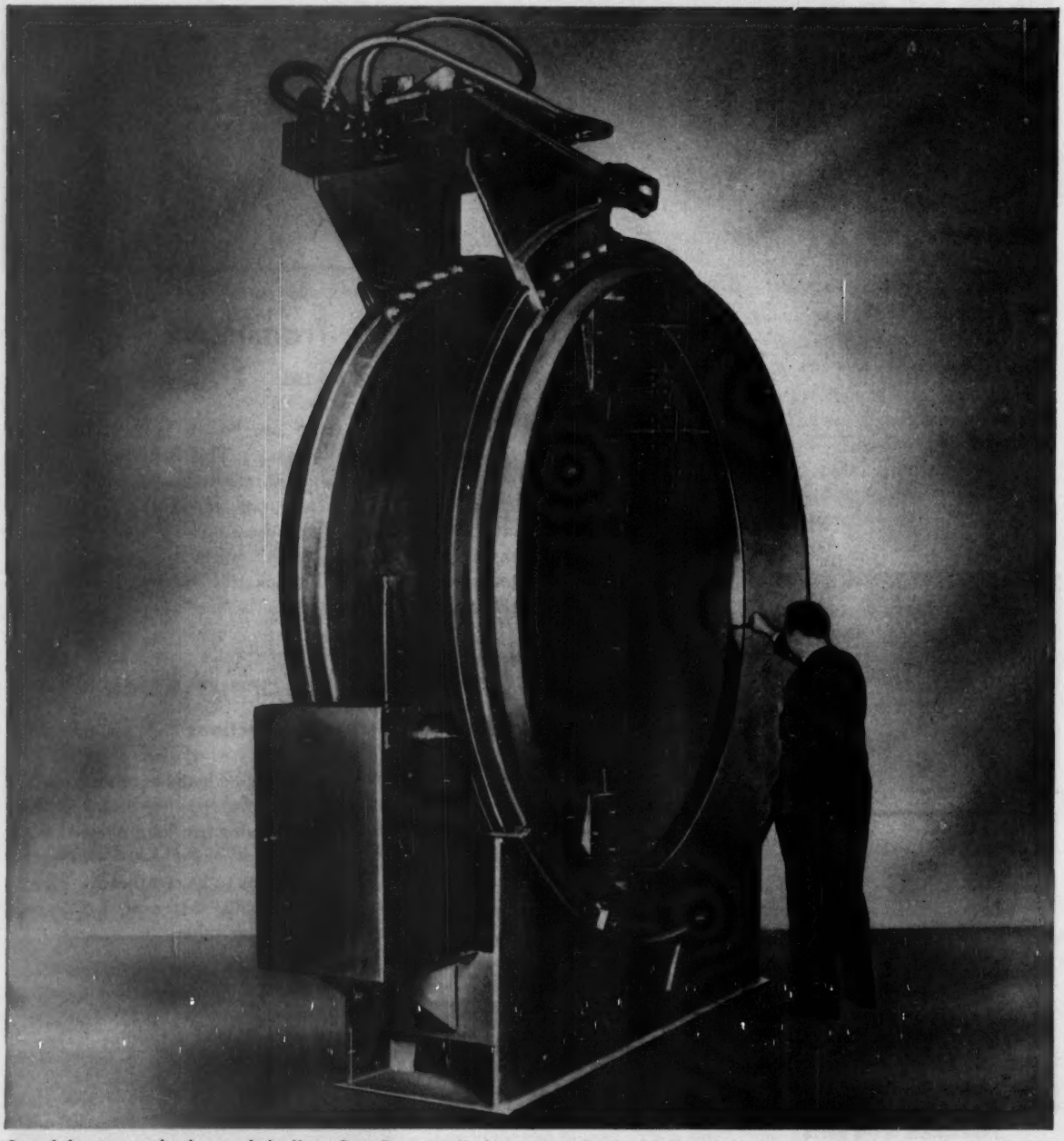
42 Operations 2.6/10¢ per part

Note the number of operations. (42 spindles are required, all working at once.) This Kingsbury machine has a 100-inch base and 30-inch index table. There are seven drilling units and one tapping unit. All are mounted horizontally and use auxiliary heads with from three to nine spindles each. Bushing carriers guide all tools but the taps. Each fixture is automatically unclamped as it indexes to the unloading station.

KINGSBURY

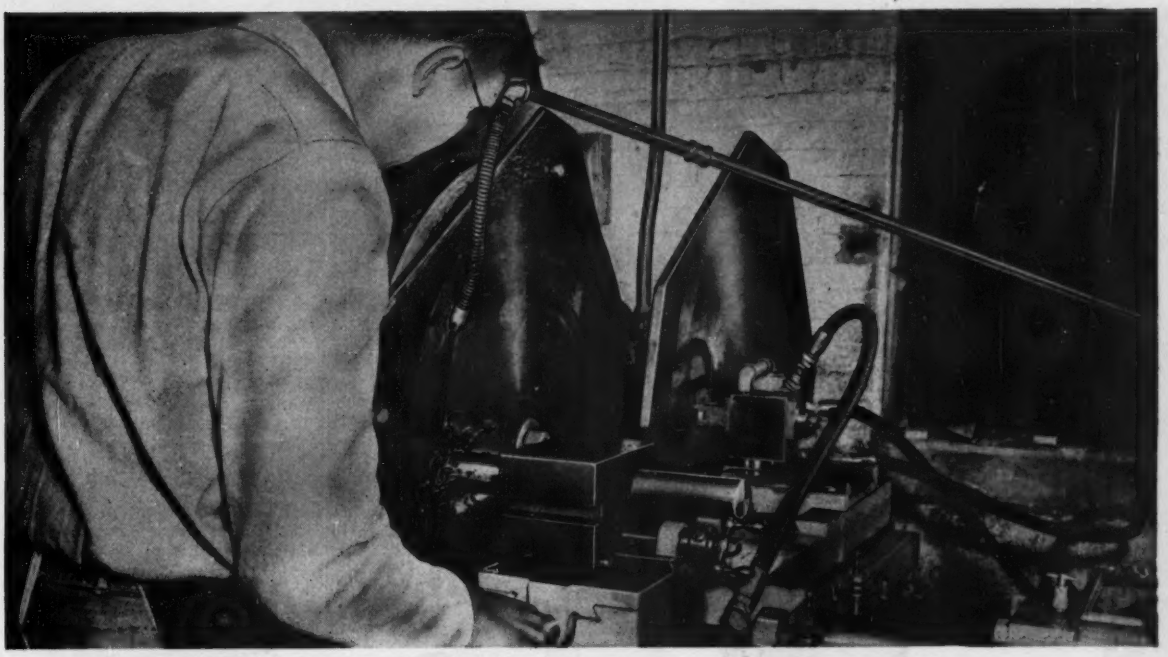
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

CUTTING TIME ON .....YET FINISH IS



One of the stress seal valves made by Henry Pratt Company. Machining time of valves' hub seal plate was halved with a Sinclair Cutting Oil.

INCONEL HALVED IMPROVED!



Contour machining of a hub seal plate for a stressed seal butterfly valve.

The Dixon, Illinois, plant of the Henry Pratt Company makes stress seal valves from 30" up to 144" in diameter that seal tight at pressures up to 300 P.S.I.

For the sealing band, Pratt uses INCONEL "X"®. This material poses rugged machining problems and preliminary machining efforts indicated excessive heating of the metal and tool wear resulting in a rough finish.

On the critical portion of the band, the hub seal plate, the company tried one of the Sinclair cutting oils with higher film strength, anti-weld qualities and cooling ability. Results? Time for turning this plate was *reduced from 9 to 4 hours*—and the *finish was greatly improved.* Also tool life was materially lengthened, meaning less downtime for the lathe.

This cutting oil, or one of the other Sinclair cutting oils and coolants, might ease *your* production headaches. It costs nothing to find out. Contact your Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS FOR METAL WORKING

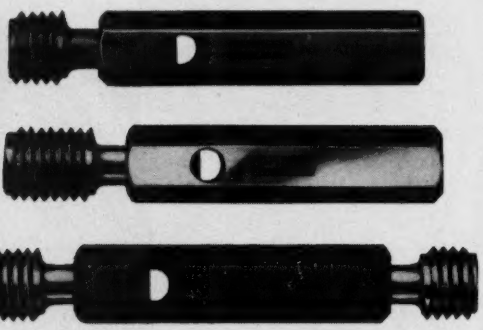
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It's the fastest thread gaging method yet devised. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages. Accommodates A.G.D. tapers No. 00, No. 0, No. 1, No. 2, and No. 3. Special sizes on request.



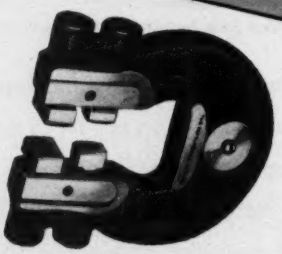
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Faster to operate than ring gages, they feature *complete thread* inspection . . . rigid mounting . . . maximum range of adjustment. Available in standard sizes with Steel or Tungsten Carbide Anvils.



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The TAFT-PEIRCE Manufacturing Co.

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T P means Top Precision



Double Diamond GEARS are built...

. . . to produce low installed cost

. . . to serve economically and dependably on the job for which you buy them

. . . and to do credit to your product and your reputation



The above quotation appears in the introduction of our new 40-page reference book which fully describes the ten types of gears in which we specialize. If you are interested in gears built to those standards have your secretary write for a copy of the complete catalog.

DOUBLE DIAMOND TRADE MARK GEARS

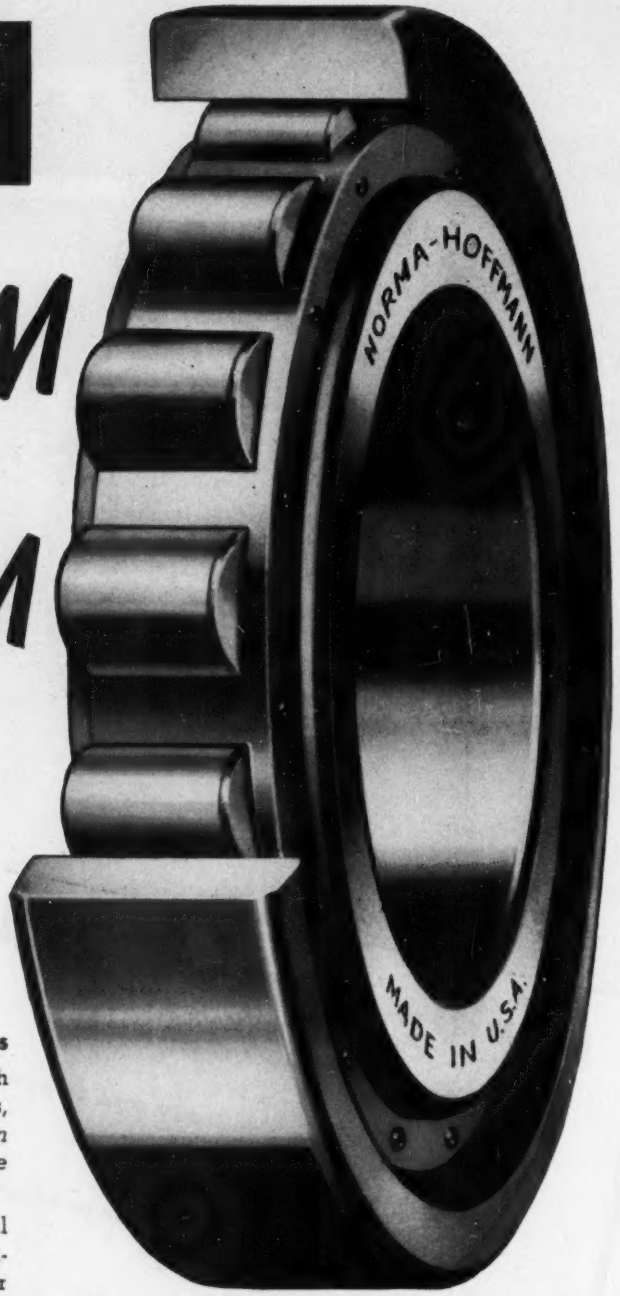
AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

Norma-Hoffmann
PRECISION MADE
Roller Bearings

Give you MAXIMUM Capacity in MINIMUM Space



And equally important — they are *interchangeable* with single-row ball bearings

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- Solid cylindrical rollers between cylindrical races provide maximum load contact area, increased steady load capacity, and a larger shock-absorbing capacity than any other type of single-row bearing.
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- Large contact area with the most efficient load distribution provides greater wear-resisting surfaces, assures true rolling between rollers and raceways, results in minimum friction between roller and cage.
- A lower friction coefficient under heavy load than any other type of bearing permits.
- Speedability equal to that of any ball bearing, size for size, up to 35,000 R. P. M.

Write for catalog or engineering assistance.

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FIELD OFFICES: Chicago, Cleveland, Detroit, Dallas, Cincinnati, Los Angeles, San Francisco, Seattle, Kansas City, Mo.

FREE

WALL CHART

(28" x 54")

FOR INDUSTRIAL FILE USERS

Here is Nicholson's up-to-date Wall Chart comprising a quick, orderly visualization of "key" types of files in each of the groups popularly known as:

MILL (or SAW) FILES

MACHINISTS' FILES

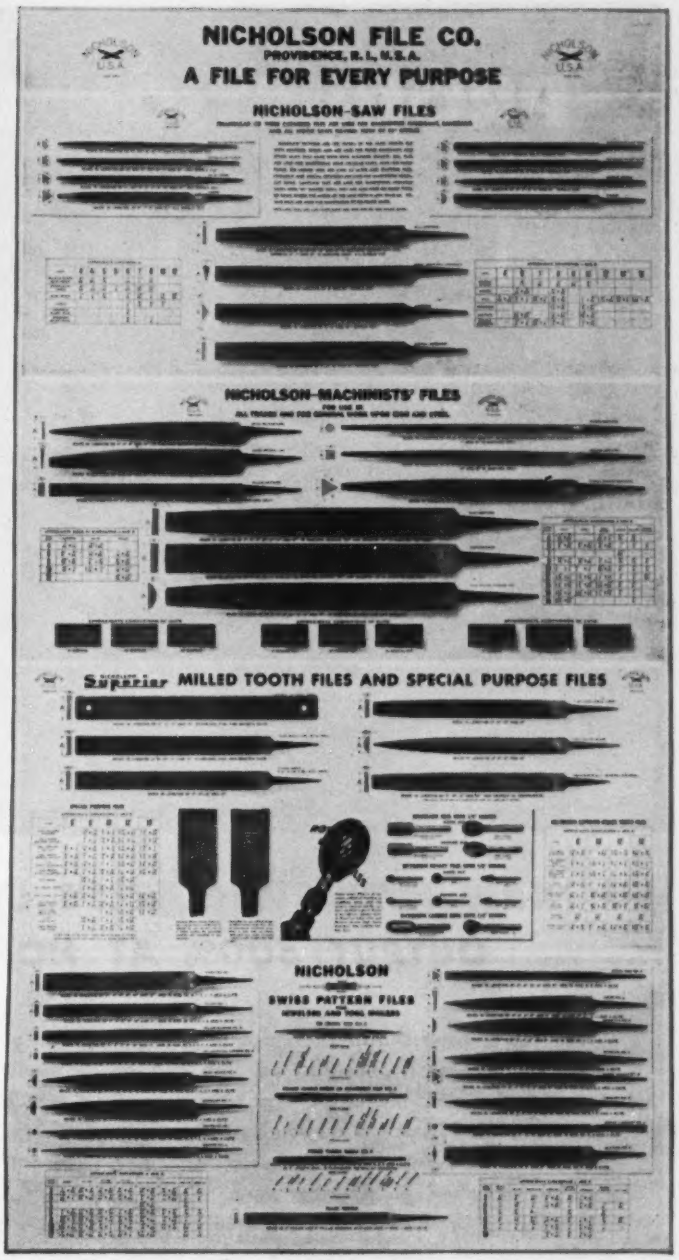
MILLED CURVED-TOOTH and SPECIAL PURPOSE FILES

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ROTARY POWER FILES and BURS

The Chart (durably cloth-backed) is a valuable aid to modern production speed and shop economy through the selection of *The right file for the job.* Purchasing, production and toolroom heads find it a most helpful guide. Trainees learn rapidly through its use with shop-school talks and demonstrations.

USE YOUR BUSINESS LETTERHEAD in writing to us for your free copy of the Chart.



Also free with each Wall Chart: A copy of the famous Nicholson book, "File Filosophy"

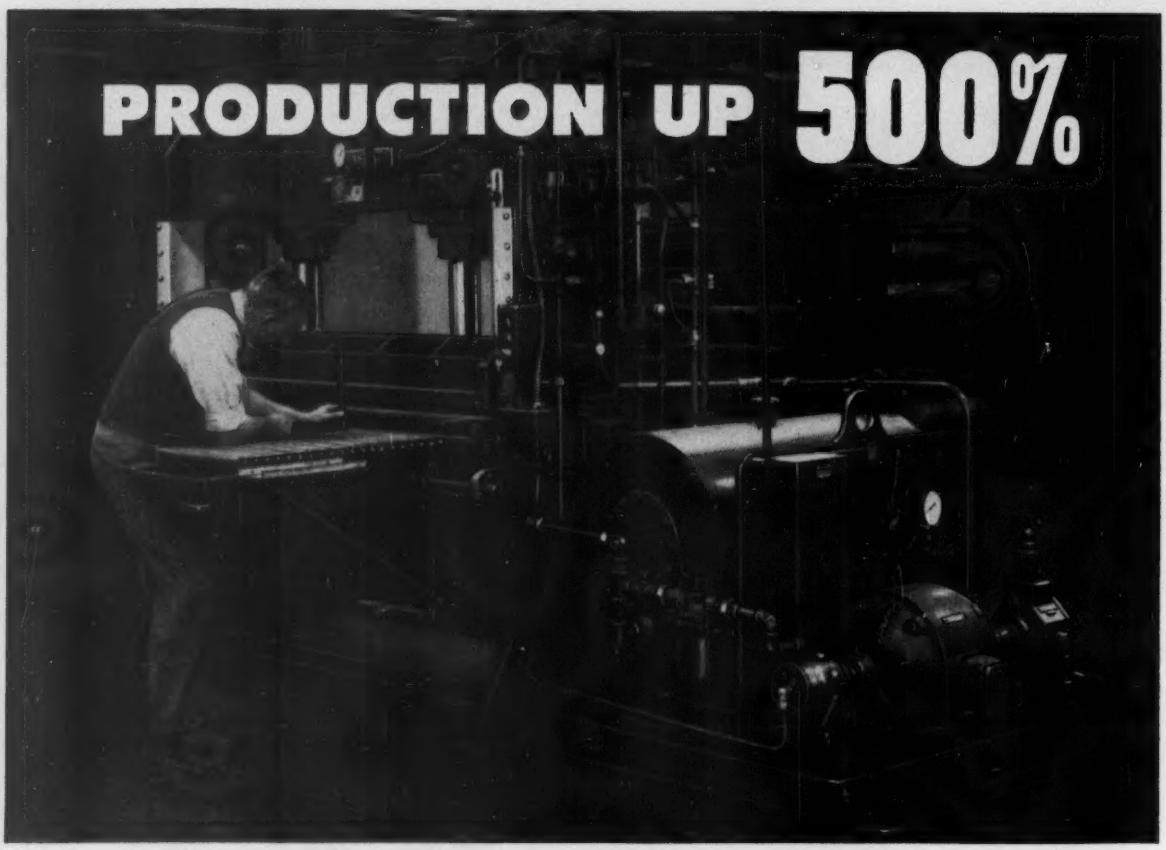


—a valuable 48-page illustrated "textbook" on kinds, use and care of files. Also elaborates on the characteristics of many of the files shown in this Chart.

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KRW HYDRAULIC PRESS UPS ASSEMBLY OUTPUT 500% AT HOPE'S WINDOWS INC.

The KRW press shown above is curing a big headache! Originally, because of the precise nature of the work, one of the most important assembly jobs at Hope's Windows, Inc., Jamestown, N. Y., was a hand operation. It was slow, painstaking work and held up production of completed Hope's windows. Then the company tried the job on a mechanical press. This didn't work out because the stroke was much too long and, of course, could not be adjusted. Finally, Hope's found the perfect answer to their problem in this 60 ton, 2 cylinder KRW Hydraulic Press.



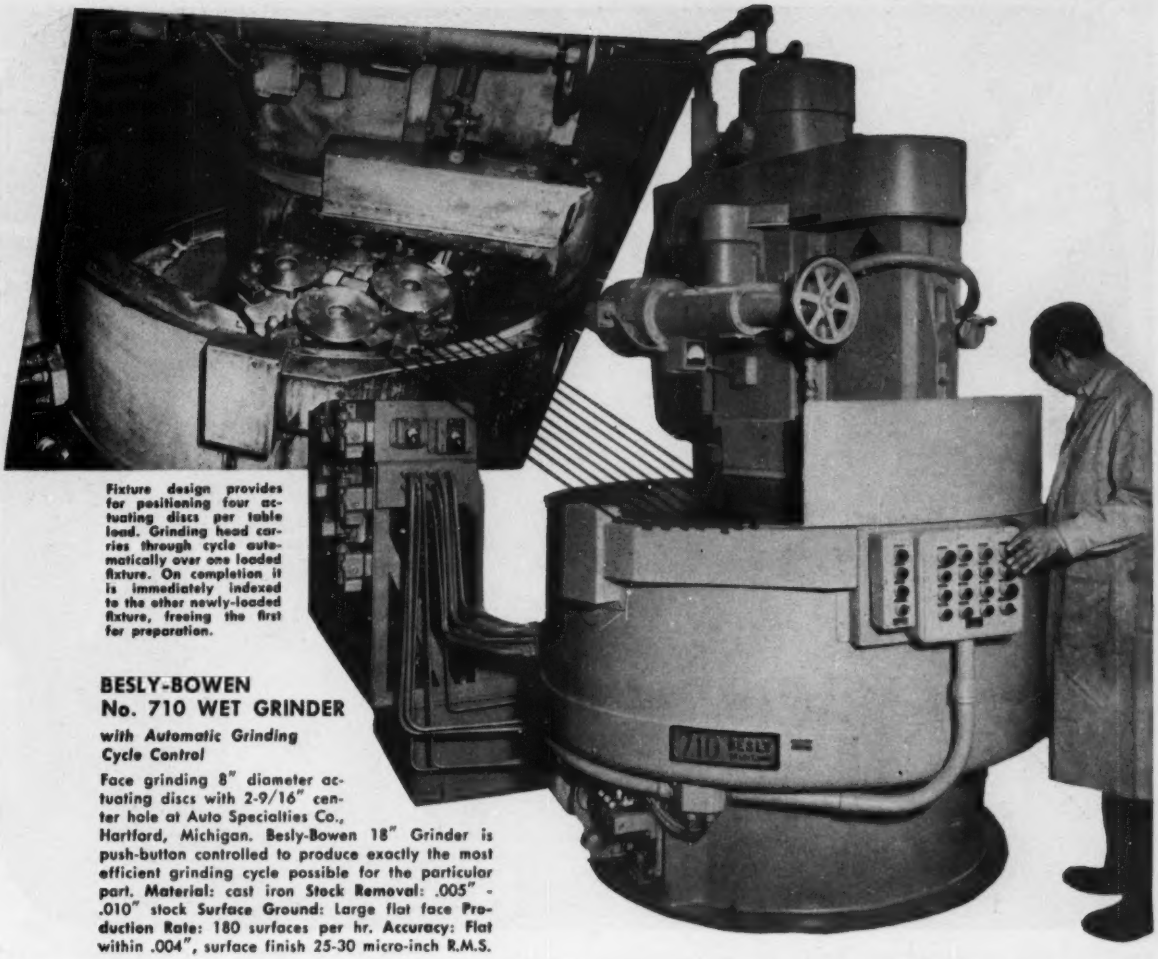
They set the stroke to 1½" — just what they needed. Result? *Every assembly job is perfect and production has increased five-fold.* The KRW Press cost 2/3 less than the mechanical press that would do the same job — AND the KRW Press can be used extensively for other production jobs through a simple stroke adjustment!

Any pressing problems in your work? Bring them to K. R. Wilson for fast, low-cost solution. One, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. Or, if you need a custom-designed press, we'll build it for you.

For facts, prices and delivery dates see your Machinery dealer or write, wire or phone Dep't. 15

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Fixture design provides for positioning four actuating discs per table load. Grinding head carries through cycle automatically over one loaded fixture. On completion it is immediately indexed to the other newly-loaded fixture, freeing the first for preparation.

BESLY-BOWEN
No. 710 WET GRINDER
with Automatic Grinding Cycle Control

Face grinding 8" diameter actuating discs with 2-9/16" center hole at Auto Specialties Co., Hartford, Michigan. Besly-Bowen 18" Grinder is push-button controlled to produce exactly the most efficient grinding cycle possible for the particular part. Material: cast iron Stock Removal: .005" - .010" stock Surface Ground: Large flat face Production Rate: 180 surfaces per hr. Accuracy: Flat within .004", surface finish 25-30 micro-inch R.M.S.

No IDLE Machine Time

BESLY-BOWEN
GRINDERS
are Multi-Purpose Face Grinders and include models 3 horse power to 30 horse power, all available with Automatic Cycle Control.

Many plants have accepted as unavoidable a grinding operation in which the operator merely stands by to supervise the grinding cycle, then busies himself while the machine is idle. Besly-Bowen Grinders bring to this situation a striking shrinkage in costs by using two rotary work tables: Over one the machine grinds *automatically* under control by the automatic cycling mechanism, while the operator works at the other unloading, cleaning, reloading. Result: continuous operation . . . no idle machine time . . . reasonable period for cleaning the fixture before re-loading thus reducing rework and scrap . . . non-intermittent working conditions and thus less pressure on the man.

This is only part of the success story on Besly-Bowen Grinders which also offer improved performance at these points: Positioning the work to the wheel is more accurate — Ample coolant directed to do the most good — Correct feed rate for most efficient stock removal. Whatever your grinding demands you should talk to the Besly representative in your territory, since the Besly Line covers all situations. But ask him specifically about the Besly-Bowen Radial Head Face Grinders. Meanwhile send the coupon below for advance literature to consider.

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Established as Charles H. Besly & Company in 1875

BESLY — BESLY Grinders, all types and sizes — Taps, Drills and Reamers by BESLY — BESLY

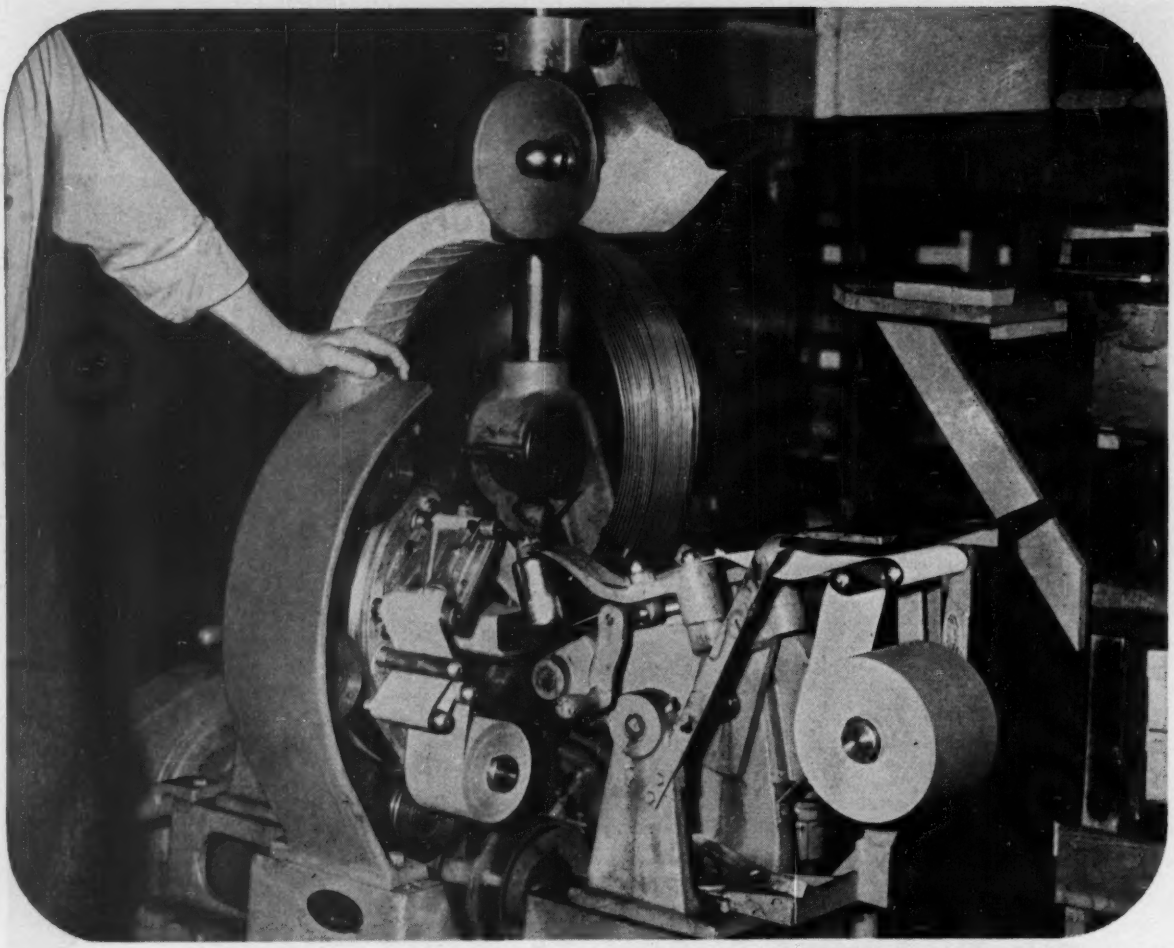
BESLY-TITAN Abrasive Wheels & Discs

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Please send us Besly Disc Grinder Booklet with detailed story of Besly-Bowen machines. Also (check here) have a representative call.

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Shell "VPI" Peripheral Wrap as applied to a coil of hard-facing alloys . . . saves expense of removing rust-preventive material . . . reduces packing costs.

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. . . cuts packing costs as much as 60%

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SHELL "VPI"

(a volatile corrosion inhibitor)

stops air and moisture from making rust.



Use WELDED STEEL for Greater Strength with Less Weight!

Above you see the Crown and Bed of an 800 Ton Press produced by Steel-Weld Fabrication in the Mahon plant for one of the largest manufacturers of heavy presses. These massive pieces, and the parts and assemblies illustrated at the left, are typical of thousands of units Steel-Weld Fabricated and machined by the Mahon Company for manufacturers throughout the country. If there are parts or assemblies in your product that could be redesigned and produced in welded steel to better advantage from a strength-weight standpoint, or, if you are faced with a limited production on an item involving heavy pieces in which pattern costs are a consideration, you can turn to Mahon with confidence. You will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to meet your requirements . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or have a Mahon Sales Engineer call on you at your convenience.

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MAHON



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

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The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

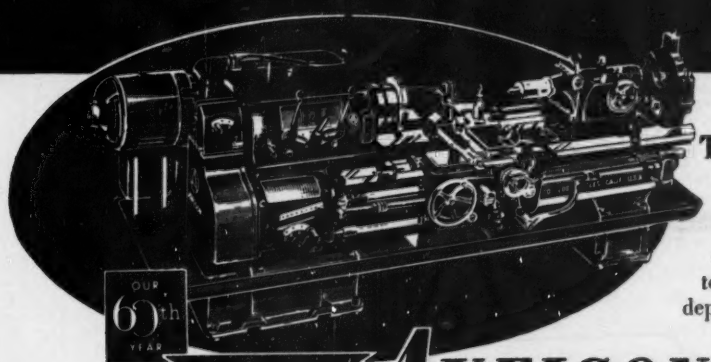
This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

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The Axelson spindle is balanced with precision and transmits a smooth flow of power without chatter through all hardened and ground gears. Four large anti-friction bearings are located strategically to control spindle deflection. All Axelson lathes are built to the same high standards which assure accuracy and dependability under heavy and continuous work loads.

AXELSON Lathes

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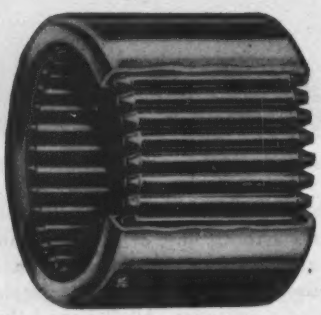
HEAVY DUTY ENGINE LATHES • TOOL ROOM LATHES • GAP BED LATHES

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tight quarters are no problem



Torrington Needle Bearings have smaller OD in relation to rated radial load capacity than any other type of anti-friction bearings.

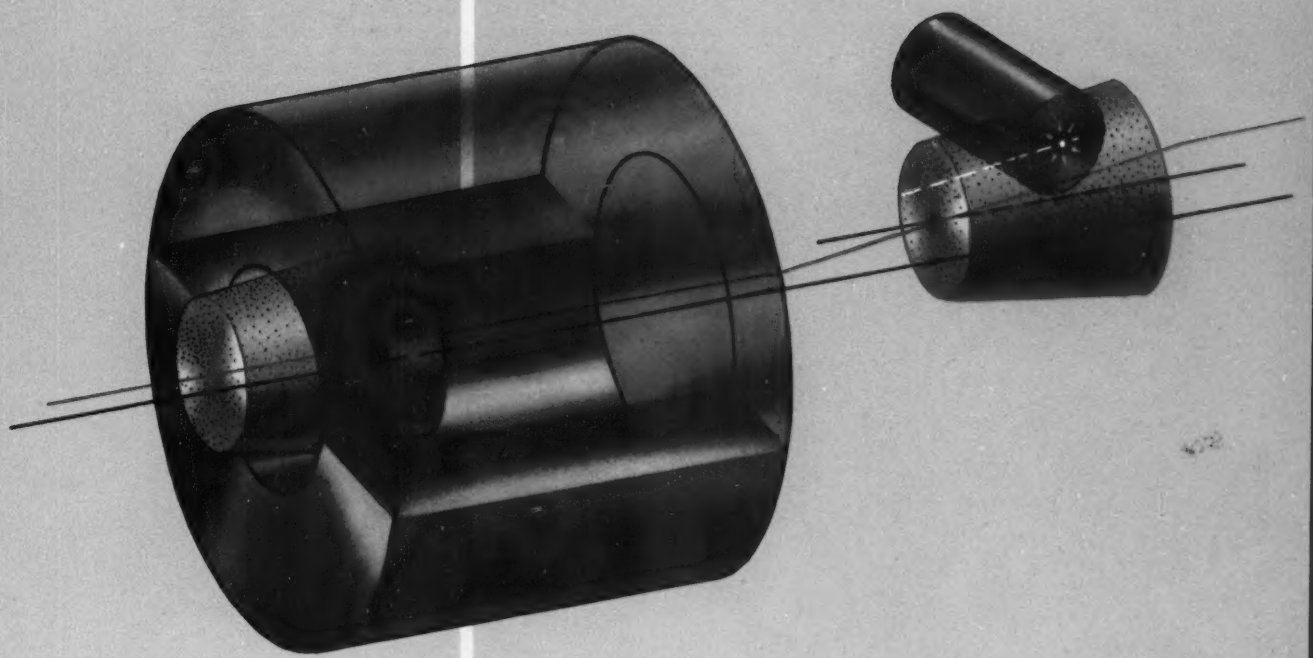
In many products, compact Needle Bearings allow reductions in size and weight of housings and related assemblies. In others, they permit the use of larger, stronger shafts without increasing housing bores.

Whatever *your* space problem, it will pay you to investigate the combination of high capacity and small OD offered by Torrington Needle Bearings. Our engineers will be glad to assist you.

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TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers



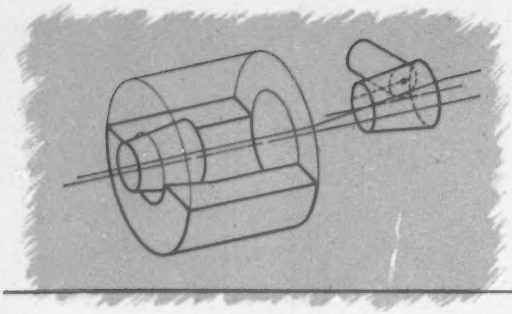
bryant
internal grinding

IT is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true only if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.

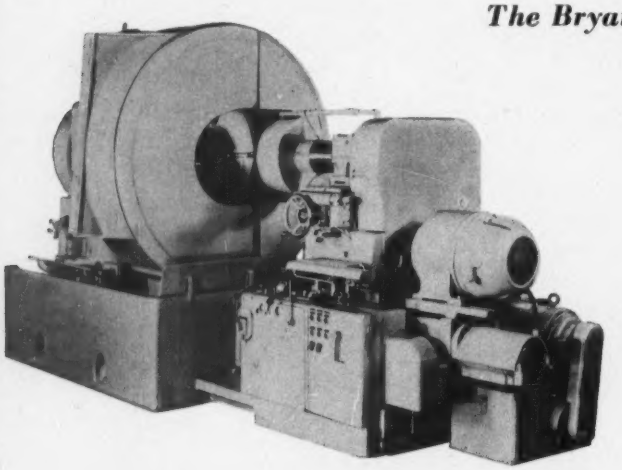
Bryant Chucking Grinder Co. Springfield, Vermont



bryant
internal grinding

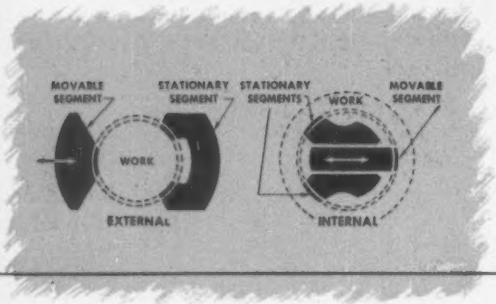
Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.

The Bryant 1460 Hydraulic Hole Grinder



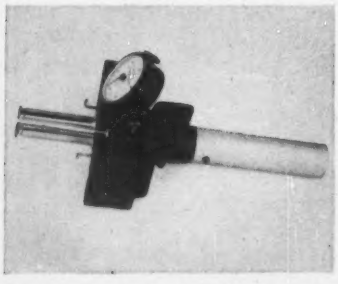
THIS massive machine will swing work up to 60″ diameter. Distance between workhead to front of work slide is 24″ minimum and 44″ maximum. The workhead will travel 16″ forward, or 14″ back of machine center to facilitate grinding large bores or faces. The full 60″ swing can be had when the workhead is adjusted to 30° for grinding a 60° included angle. Long work may extend back through 9″ spindle bore. Hydraulic controls make the 1460 easy and convenient to operate. Write for full information.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.



bryant
thread gaging

Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assembleability.



The Bryant P-11 Portable Thread Gage

THIS is basically a split plug gage, equally effective for bench inspection or for gaging internal threads on parts still held in the machine, or in large work that is difficult to move to the inspection department. *4 to 5 times faster than plug gaging!* Standard range is 5/16″ to 4¾″ P.D. Write for catalog describing full line of Bryant Thread Gages.

UNIVERSAL DRILL BUSHINGS

GIVE YOU ALL THESE OUTSTANDING FEATURES



1—super finish reduces wear to a minimum





2—blended radius reduces tool hang up

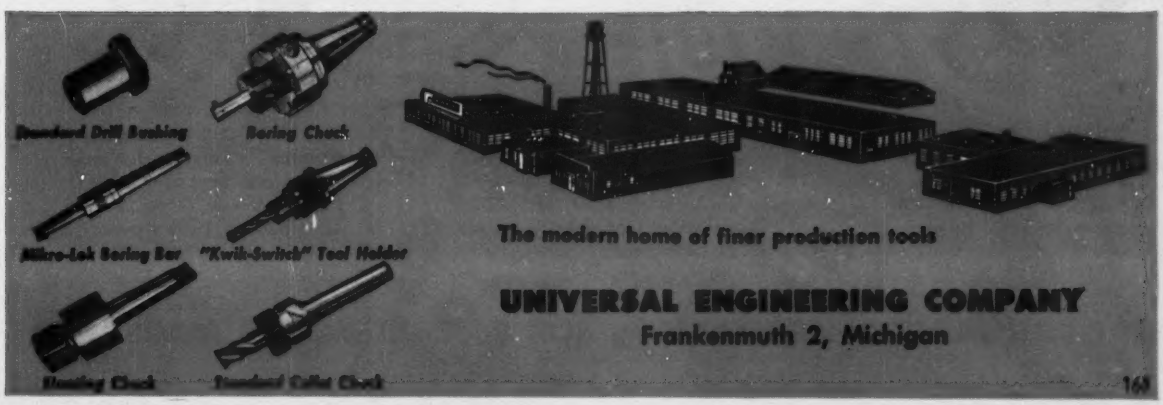


5—complete variety of sizes and lengths

4—knurled head provides quick sure grip

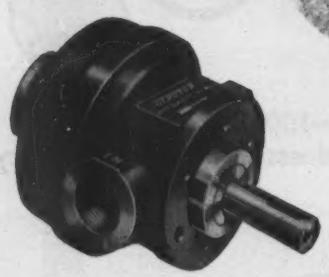


3—100% concentricity and hardness tests assure accuracy



"stout heart" of any hydraulic circuit

GEROTOR hydraulic pumps



Series "B" Hydraulic Pumps . . . 3 sizes, for continuous pressures up to 1000 p.s.i. Deliveries from .4 to 1.5 g.p.m. at 1800 r.p.m.



Series "QH" Hydraulic Pumps . . . 4 sizes, for continuous pressures up to 1200 p.s.i., intermittent to 1500. Deliveries from 3 to 12 g.p.m. at 1200 r.p.m.

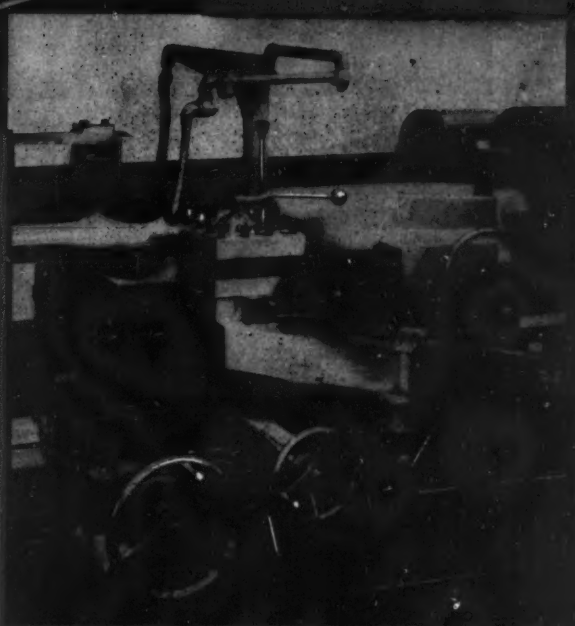


Series "O" Hydraulic Pumps . . . 4 sizes, for continuous pressures up to 1000 p.s.i. Deliveries from 20 to 40 g.p.m. at 1200 r.p.m.

GEROTOR MAY CORPORATION, BOX 86, BALTIMORE 3, MARYLAND

2 hrs. versus 9½ hrs.





This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

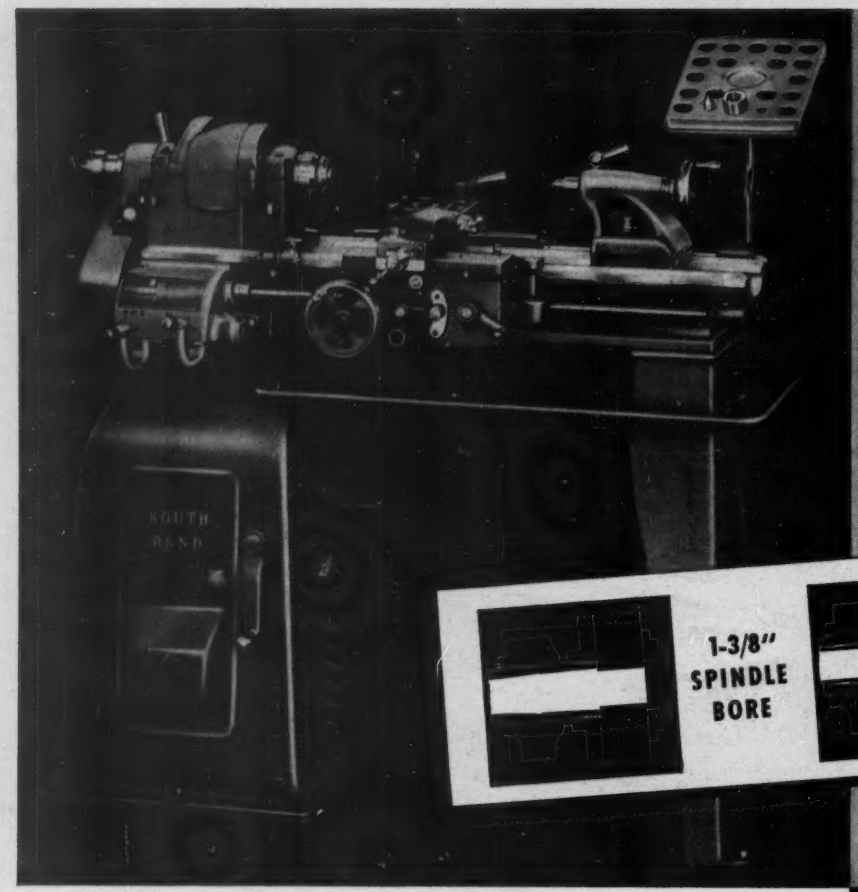
More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



SOUTH BEND 10" Lathes

10" *Precision* TOOLROOM LATHE

Sound design, expert workmanship and quality materials give the 10" South Bend Lathe the dependable performance you want. Equipped with a precision lead screw, thread dial indicator and thread cutting stop, you can use it with confidence for cutting screw threads, making precision gauges or turning out instrument parts.

Another outstanding feature is the 1" collet capacity and 1-3/8" spindle bore which is built on the same design and specifications of larger lathes. The large spindle bore gives you big lathe collet capacity in a small, compact unit.

You will like the way this lathe cuts idle time . . . reduces costs . . . releases big lathes for heavy work. Write for catalog *today*.

SPECIFICATIONS

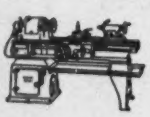
SWING 10⅛" over bed and saddle wings, 5¾" over cross slide.
COLLET CAPACITY . . . . 1 in.
SPINDLE BORE . . . . . 1⅜ in.
BED LENGTHS 3, 3½, 4, 4½ ft.
CENTER DISTANCES . . . 14¾ to 34¾ inches.
SPINDLE SPEEDS (12) 50 to 1357 r.p.m., approximately.
POWER LONGITUDINAL FEEDS 48 R.H. or L.H. . . .0015" to .0836"
POWER CROSS-FEEDS 48 . . . .0006" to .0309"
THREAD CUTTING 48 R.H. or L.H. pitches, 4 to 224 per inch.
MODELS Quick Change Gear and Toolroom, bench and floor type.

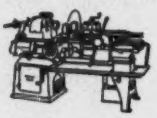
SEND INFORMATION CHECKED:

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☐ 9" and 10" BENCH LATHES


☐ 10" to 16-24" FLOOR LATHES


☐ ½" and 1" Collet TURRET LATHES


☐ 14" DRILL PRESSES


☐ 7" BENCH SHAPERS

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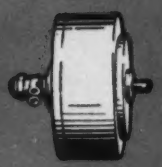
Air and Hydraulic Operated Chucks



Air-Draulic Cylinders

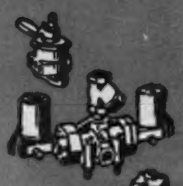


Rotocast Hydraulic Cylinders





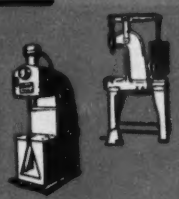
Rotating and Nonrotating Air Cylinders



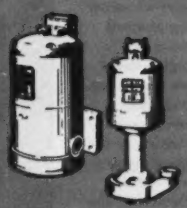




Hydraulic and Air Valves, Air-Operated Vises and Fixtures



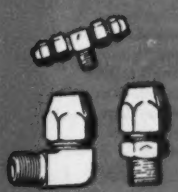
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FLUID POWER SPECIALISTS SINCE 1916

YEARS OF RESEARCH,
ENGINEERING AND PRODUCTION "KNOW HOW" HAS MADE

WALES

HOLE PUNCHING AND NOTCHING EQUIPMENT

the most complete line



Showing a setup of Wales independent, self-contained Hole Punching and Notching Units with the finished flat sheet in the foreground. Note, nothing is attached to press ram.



Showing a setup of Wales Horizontal Type Units for punching holes in curved and straight flanges and rims with the curved flanged work nested in position ready to be punched around the entire rim. Note, these units are mounted on templates.

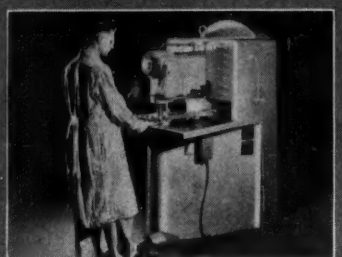


Showing two progressive, self-contained Wales Box-type Assemblies. With Wales Hole Punching Units, any good mechanic can make a hole punching die for press brakes or stamping presses.

✱ Only creative ability can produce an original and complete line of new patented products. That, basically, is what has made Wales Equipment the leader in tooling for hole punching and notching.

Many metal fabricators have made it standard practice to call in Wales Service Engineers whenever tooling is being planned for hole punching and notching in angles, channels, extrusions and sheets. These fabricators have found it is more economical and time saving to call on Wales before designing and building special hole punching and notching dies because STANDARD Wales Units can be used at greater savings.

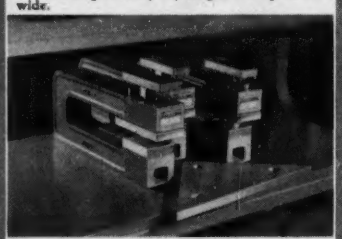
Take advantage of the years of Wales research, engineering and "know how" by writing TODAY for fully-illustrated, functionally colored catalogs of this complete line of Wales Equipment.



Wales Fabricator provides rapid interchangeability for punching and notching. Work from blueprints or operation sheets. No templets required.



Wales Drilling Machine with Boring Head is specially designed to meet the exacting requirements of locating, drilling, reaming and boring holes in material of practically any length and up to 36" wide.



Showing a setup of Wales Type "H5" Hole Punching Units for punching mild steel up to 3/4" thick. This high capacity unit is typical of the versatility and wide range of uses of Wales Hole Punching and Notching Equipment.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

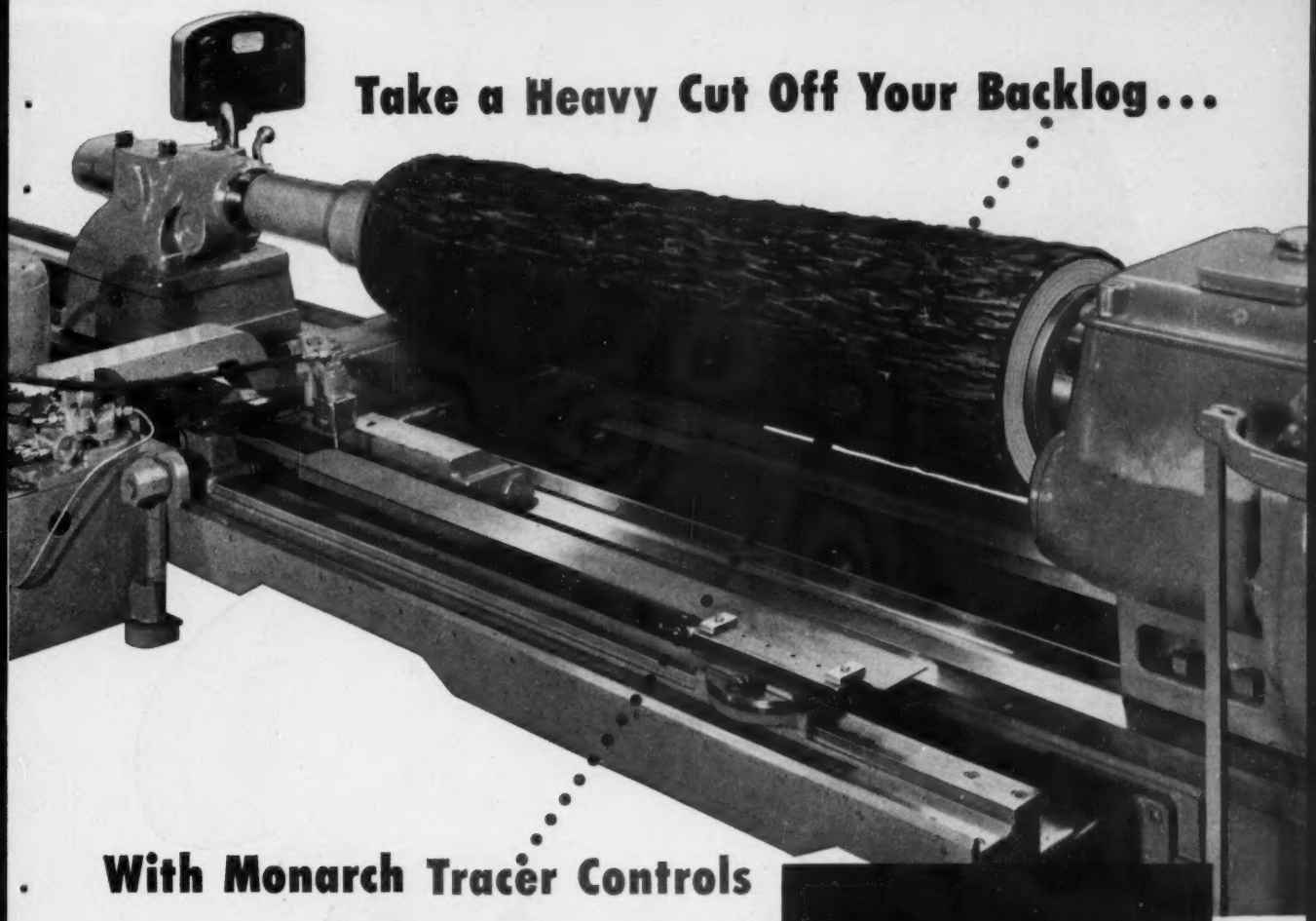
375 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Take a Heavy Cut Off Your Backlog...



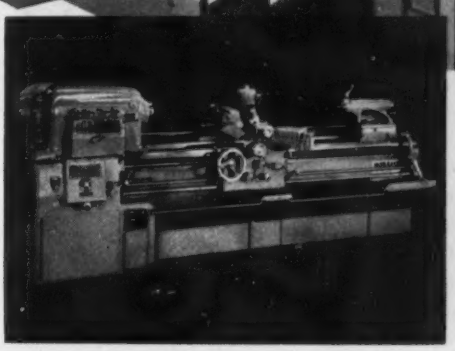
With Monarch Tracer Controls

Increased output within your present plant limitations is the quickest answer to today's demands—increased output as provided by Monarch tracer-controlled single point turning. Most new Monarch lathes can be equipped with one of the *three* types of Monarch tracer controls best suited to get this result.

Look at these actual job records! On a rotary grinder casing formerly turned on a turret lathe—*machining time cut* from over 22 minutes to 6. On a rear wheel spindle, formerly produced in over 2½ minutes on 2 machines (one roughing and one finishing)—*machining time cut* to 24 seconds on a single Mona-Matic. On an aircraft engine mount, *machining time cut* from 47 minutes to 20 minutes, with 6 separate operations eliminated and accuracy and finish improved. On a 120" printing press roll, *turning time cut* from 7½ hours to 1½ hours.

You'll notice that we're talking increased output. Isn't the decreased cost obvious? And isn't this the equivalent of adding to your floor space? You can read all these into your production figures. Bear in mind that with the easily set up tracer controlled principle, you can realize all three advantages on short runs as well as long ones.

This is certainly the time to investigate production improvements like these. We'll gladly answer your inquiry with complete data, job facts, descriptions . . . *The Monarch Machine Tool Co., Sidney, Ohio.*



Monarch Series 60 Engine Lathe with Air-Gage Tracer Controls. For turning multiple diameter shafts and turning, boring or facing contours. Available with or without fully automatic cycle. Monarch has built fine lathes since 1909—3 types of tracer controls beginning in 1930.

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TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH



It pays to "Meet the Family" of the First Self-tapping Screw

The *original* Self-tapping Screw was the Parker-Kalon Type A. Today P-K makes several standard types, and hundreds of modifications can be made to special order. Here's why it will pay you to "meet the family".

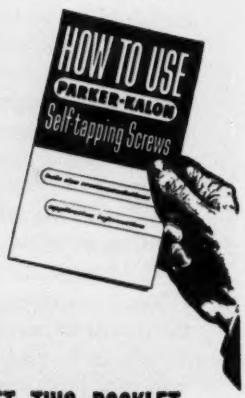
From this wide selection you can choose the screws best suited to your fastening job, often several types in the same assembly. There is no need to fit the job to any single type of screw.

That's why the advice of a P-K Assembly Engineer is unbiased. You can get the help of this fastening specialist on request. With the experience of more than a million applications to draw on, he can quickly determine the best way to replace slow, complicated assembly techniques with the fast, easy, efficient P-K method.

Question *every* fastening. A P-K Assembly Engineer will help you start making the savings you've been missing.







PARKER-KALON®

The Original **SELF-TAPPING SCREWS**

AND OTHER FASTENING DEVICES

GET THIS BOOKLET

Tells "where to use what" type of screw in all types of metals and plastics, gives hole-size recommendations and other information. Ask your P-K Distributor for Form 480. Or, write Parker-Kalon Corporation, 202 Varick Street, New York 14.



NOW HE KNOWS IT'S RIGHT. "He" could be a final or process inspector, a foreman or a tapping machine operator . . . anyone at a key point on the production line. . . .

But, he could also know when all is **not** well. This gage could warn of a dull tap, a drill going wrong, misalignment in a set up. All these and other faults can be detected by proper gaging.

Know that it's right. Prevent waste. Use good gages!

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

GEO MET RIC C

Style C



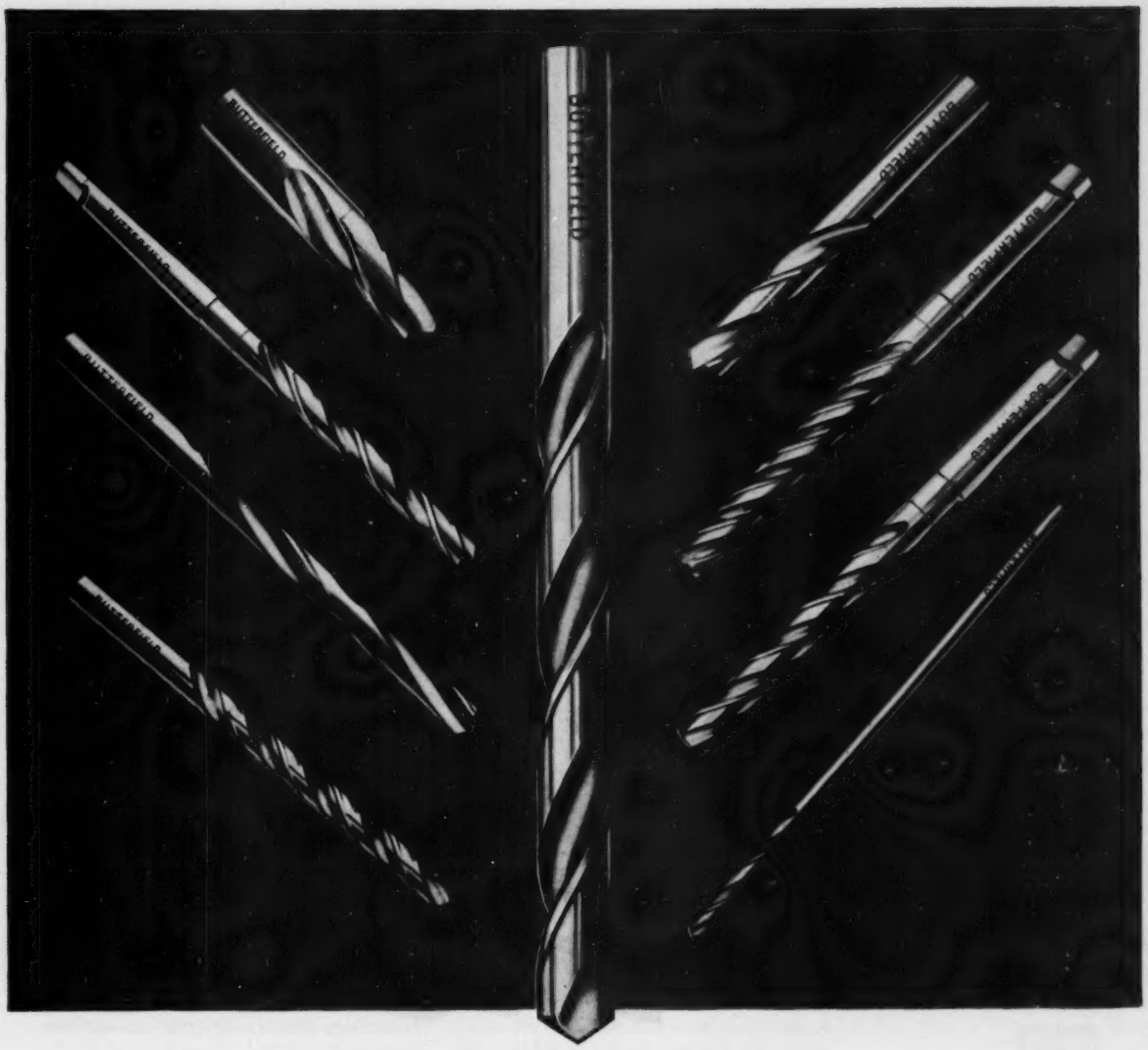
SPECIFICATIONS STYLE C WITHOUT LATERAL FLOAT ... -OFF TRIP

Style and ‡Size Inches	Construction Number	CAPACITY: Straight Threads: Diam. Inches	CAPACITY: Straight Threads: Lgth.	CAPACITY: Straight Threads: Coarsest Pitch	CAPACITY: Standard Pipe Threads	Code Word	A	B	C	D			SHANKS: Standard: Dia.	SHANKS: Standard: Lgth.	SHANKS: Also Available: ‡Max.: Dia.	SHANKS: Also Available: ‡Max.: Lgth.	SHANKS: Also Available: △Min.: Dia.	SHANKS: Also Available: △Min.: Lgth.
C-1 ⅛	12678-K	⅛" to 1 ⅛"	2"	8	⅛"– ¼"	Cameo	3⅛"	3"	1⅛"	1⅛"	1⅛"	1⅜"	1 ¼"	3⅜"	1 ½"	3⅜"	1"	1 ¼"
C-1 ⅛	A6393-D	⅛" to 1 ⅛"	2"	8	½"–1 ¼"	Canter	4½"	3⅛"	2⅛"	1⅛"	1⅛"	1⅛"	1¾"	4"	2⅛"	4"	1⅛"	2"
C-2 ⅛	A5167-J	1 ⅛" to 2 ⅛"	2 ⅛"	8	1" –1 ½"	Canvas	4⅛"	3⅛"	2⅛"	2⅛"	1⅛"	1⅛"	2"	4½"	2⅛"	4⅛"	1¼"	2"
C-2 ⅛	20504-P	1 ⅛" to 2 ⅛"	2"	8	1 ¼"–2"	Carte	5¼"	3⅛"	2⅛"	2⅛"	1⅛"	1⅛"	2¼"	4½"	2⅛"	4½"	1¼"	2"
†C-2 ½	12744-D	1 ⅛" to 2 ½"	3⅛"	7	1" –2"	Carmine	5⅜"	4⅛"	2⅛"	2⅛"	1⅛"	2⅛"	2¼"	4½"	3"	4¾"	1½"	2¼"
C-3	30123-H	1 ½" to 3"	2 ½"	8	1 ¼"–2"	Catch	5⅛"	3½"	3⅛"	3⅛"	1⅛"	1⅛"	2¼"	4½"	3⅛"	4¾"	1½"	2¼"
†C-3 ⅛	93271-R	2 ⅛" to 3 ⅛"	2⅛"	8	2"	Cement	6½"	3⅛"	4⅛"	3⅛"	1⅛"	2⅛"	2½"	5"	4⅛"	5"	1⅛"	2½"
†C-4 ⅛	49270-C	2 ⅛" to 4 ⅛"	3½"	7	***2 ½"–4"	Certain	8¼"	5⅛"	5⅛"	4⅛"	1⅛"	2⅛"	2⅛"	5½"	5"	5½"	2"	3"
†C-6	28831-E	3 ⅛" to 6"	3⅛"	7	***3" –5"	Chauk	11"	5⅛"	6⅛"	6¼"	1¼"	3"	3"	5⅜"	5½"	5⅜"	2¼"	3"

‡Other sizes can be furnished where required. Price quoted on specific inquiries.
†These Die Heads are fitted with Roughing and Finishing Attachment.
Length that can be cut when shank is solid.
***Projection Chasers required for pipe sizes within listed capacities.

‡Maximum shank without burring.
△Minimum recommended size.

GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT



NOW... BUTTERFIELD BRINGS YOU TWIST DRILLS

Twist Drills In All Popular Types, For Every Material, Are The Latest Additions To Butterfield's Line Of Taps, Dies, Reamers And Screw Plates . . . *All 100% Inspected.* Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES • TWIST DRILLS



Checking for micro-hardness on a Tukon Tester . . . part of the specialized equipment used in Butterfield's 100% inspection.

SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

ARMSTRONG



More Tools Per Man for More Profit

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now, with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

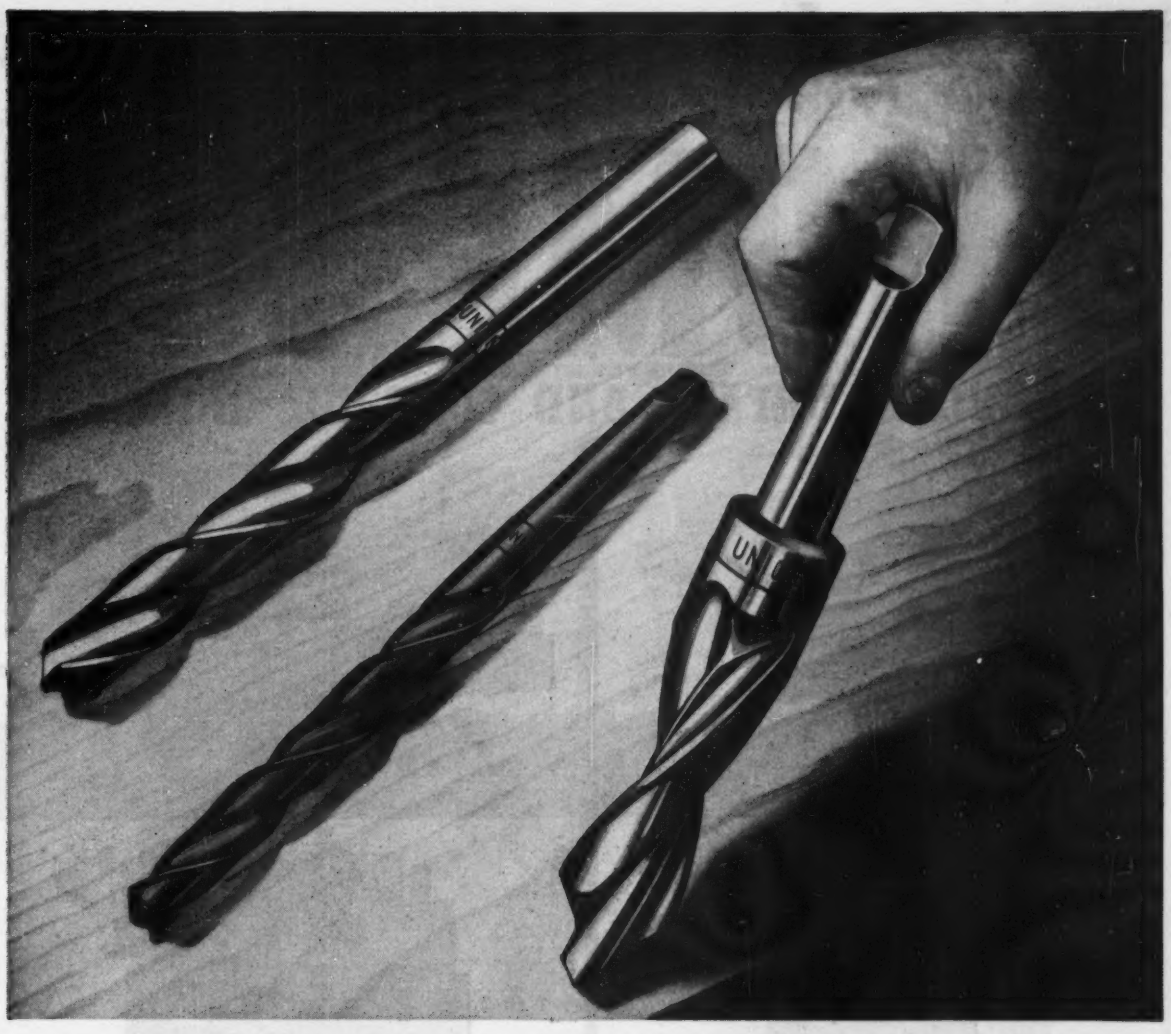
See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up Tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs . . . Today, only quality tools can be truly economical.

Write for the ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5213 W. ARMSTRONG AVENUE CHICAGO 30, U.S.A.
New York and San Francisco

Armstrong Tools are Stocked by Industrial Distributors





WHICHEVER TYPE YOU CHOOSE, you're sure of accurate, fast-cutting, long-lasting performance when you choose Union Twist Drills.

Union Straight Shank Drills come in carbon steel (No. 110) and high speed steel (No. 510) in 89 diameters from ⅛" to 2". *Union Heavy Duty Taper Shank Drills* come in high speed steel (No. 370) in 81 diameters from ¼" to 1½".

Union Sub-Land Drills are specials made of high speed steel and are designed for drilling holes of two or more diameters in one operation.

The margin of each step is continued the full length of the flute so that these drills, by repeated sharpening, can be used the entire length of the fluted section.



no other twist drill will outperform a **UNION**

contact your local distributor

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters  Gear Cutters  Twist Drills  Hobs 

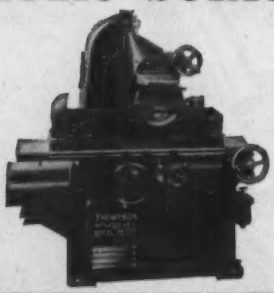
Reamers  Carbide Tools 

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

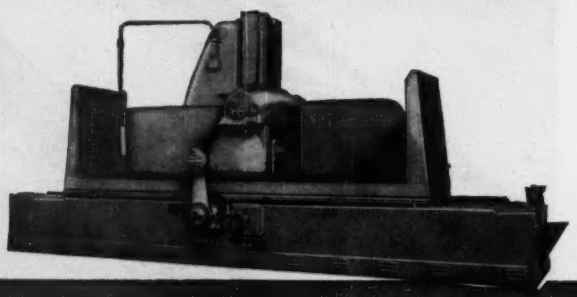
Save Time and Money ... Select

THOMPSON

HYDRAULIC SURFACE AND CONTOUR GRINDERS



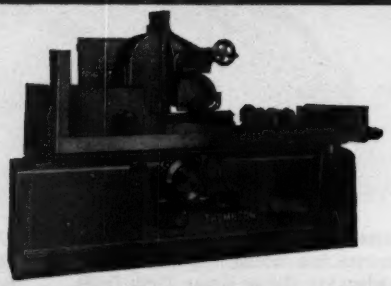
TYPE S



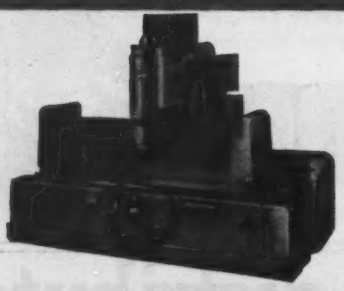
TYPE C & CX



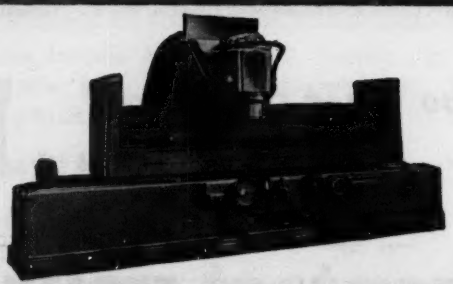
TYPE F



TYPE S & C TRUFORM



VERTICAL SPINDLE



HYDROVERT

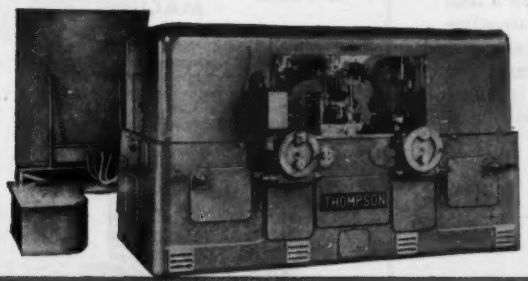
Write Thompson today for details ...

1 **WIDEST RANGE** of light and heavy duty Surface and Contour Grinders

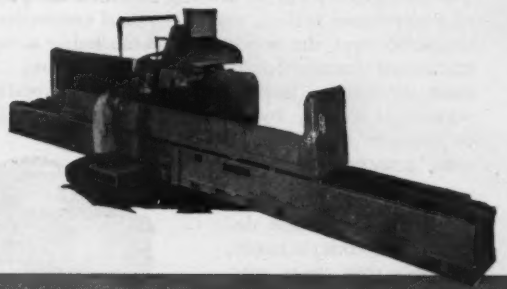
2 **HIGHEST ACCURACY** for lower costs

3 **PROVED QUALITY** for longer service

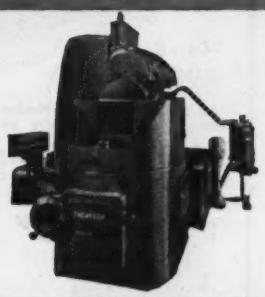
4 **SPECIAL MACHINES** for any surface and contour grinding application



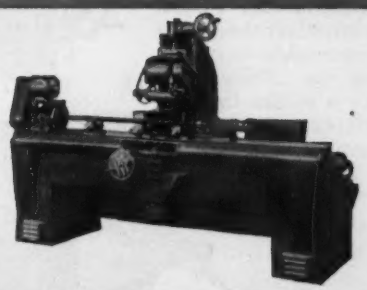
DOUBLE WHEEL BUCKET AND BLADE GRINDER for jet aircraft



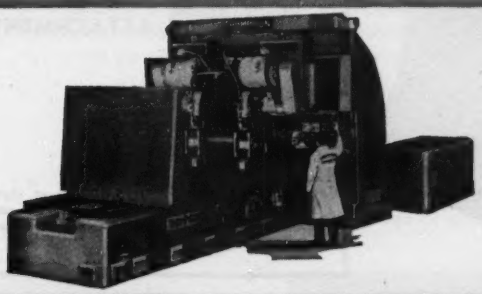
WAY GRINDERS Many sizes and types from 12x11x48 to 50x36x240



TWIN CHUCK ROTARY GRINDER For grinding circular metal discs 6 to 12 inch and 6 to 16 inch sizes



NEW SERIES 600 MANUAL BROACH GRINDER Sizes 4x48 to 6x96



RAIL TYPE HYDRAIL Widest grinder ever built sizes 48x36x96 to 72x36x240

Thompson SURFACE Grinders

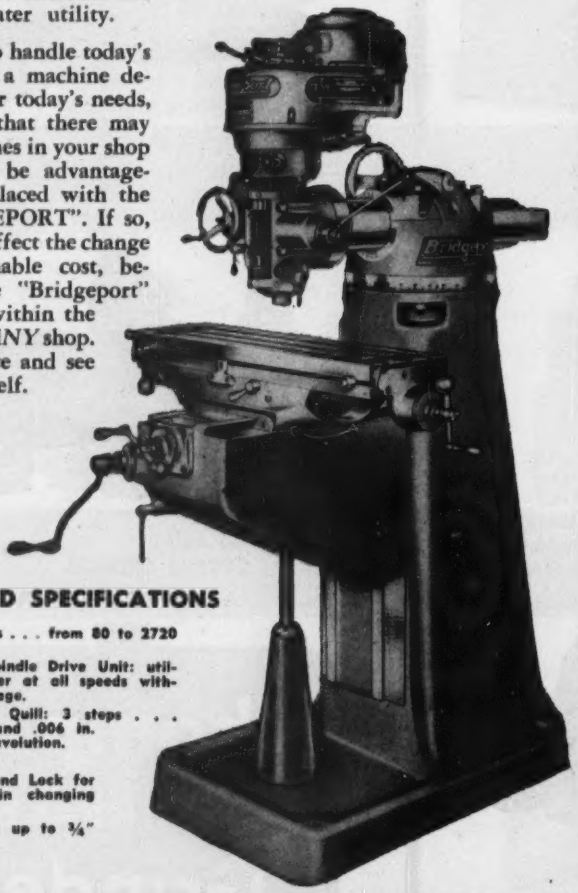
The Thompson Grinder Co., Springfield 1, Ohio

THE *Bridgeport* TURRET MILLING MACHINE

Outstanding in Popularity
because
Outstanding in Performance

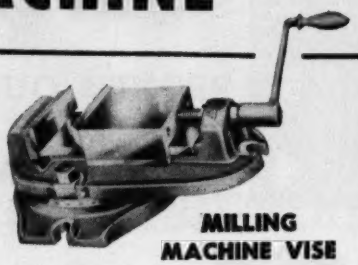
The Bridgeport Turret Milling Machine has proved itself a tool of exceptional utility, versatility and convenience in countless shops all over the world. Its remarkable acceptance and the continued demand for it mean but one thing . . . this machine definitely fills an important need in metal working . . . a need which grows day by day as new attachments are developed to provide facilities for even greater utility.

Ability to handle today's work on a machine designed for today's needs, suggests that there may be machines in your shop that can be advantageously replaced with the "BRIDGEPORT". If so, you can effect the change at reasonable cost, because the "Bridgeport" price is within the reach of *ANY* shop. Investigate and see for yourself.



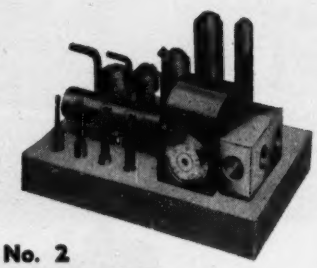
CONDENSED SPECIFICATIONS

- 8 Spindle Speeds . . . from 80 to 2720 RPM.
- Back Geared Spindle Drive Unit: utilizes full power at all speeds without belt slippage.
- Power Feed to Quill: 3 steps . . . .0015, .003 and .006 in. per spindle revolution.
- Quill Travel: 5".
- Spindle Brake and Lock for convenience in changing tools.
- Collet Capacity: up to ¾" diam.



MILLING MACHINE VISE

An improved vise that provides greater gripping power, is streamlined for appearance and incorporates a coolant trough. A large diameter screw assures rigid holding. Made in two sizes: 5" x 3½" and 6" x 5" jaw openings.



No. 2 BORING HEAD

Boring Tools and Holder provide the means for boring holes up to 6" diameter. Available for use on Bridgeport 1HP Milling, Drilling and Boring Attachment.



No. 3 HEAVY DUTY RIGHT-ANGLE ATTACHMENT

Designed for milling and drilling at right angles. Can also be used for boring, and reaming, cutting gears, hobs and broaches, sawing and slitting.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

DANLY

is faster!



... for Piercing

... for Punch Extruding...

... for Trimming

... for Riveting...

You can pierce, trim, extrude or rivet at less cost because you can do it faster with Danly Hydraulic Metalworking Equipment! Check these new cost and time saving advantages:

• ***Greater Capacity*** . . . the exclusive Danly hydraulic system minimizes break-through shock and permits smoother operation at higher pressures. You can pierce holes smaller in diameter than the thickness of your steel!

• ***Automatic Stripping Action*** . . . set-up and operation are greatly simplified because blank-holding and stripping action is an integral part of the Danly power cylinder cycle . . . completely hydraulic.

• ***Less Down Time*** . . . hardened and ground wear surfaces and extra long guides assure maximum tool life. Springs and rubber cushions, a major cause of failure, are eliminated.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY®

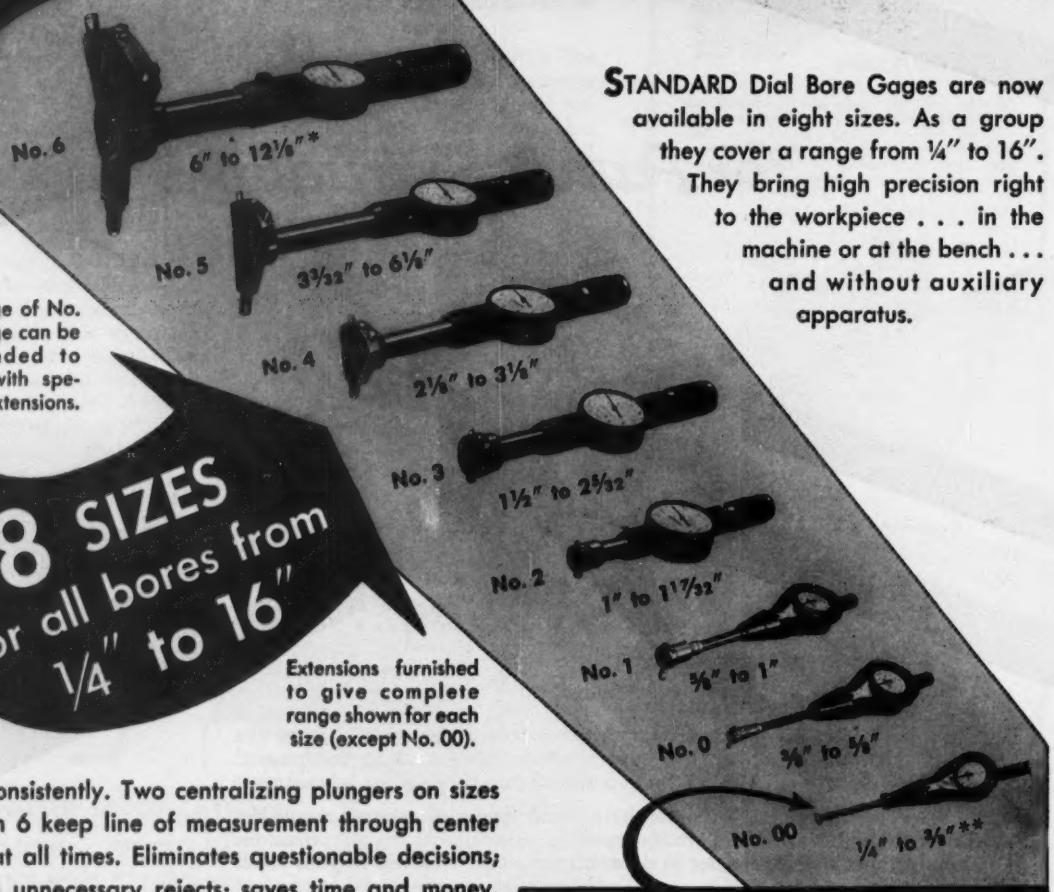
HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES... 50 TO 3000 TONS

Application possibilities are almost unlimited because Danly Hydraulic Metalworking Equipment is engineered to meet your specific needs. Write today for complete information.

Now!...a Wider Range!

STANDARD DIAL BORE GAGES

for Positive, Direct, Precision Measurement



STANDARD Dial Bore Gages are now available in eight sizes. As a group they cover a range from ¼" to 16". They bring high precision right to the workpiece . . . in the machine or at the bench . . . and without auxiliary apparatus.

*Range of No. 6 Gage can be extended to 16" with special extensions.

8 SIZES for all bores from ¼" to 16"

Extensions furnished to give complete range shown for each size (except No. 00).

Repeat consistently. Two centralizing plungers on sizes 0 through 6 keep line of measurement through center of bore at all times. Eliminates questionable decisions; minimizes unnecessary rejects; saves time and money.



VERTICAL TYPE

VERTICAL 90° TYPE

PISTOL GRIP TYPE

In addition to above, special gages available for out-of-ordinary applications.

NEW!

The No. 00 Gage with Centering-size Discs for checking bores ¼" to ⅜" with tolerances up to .005"

**Regularly supplied with a centering-size disc made for dimension specified by user. Discs of other sizes may be readily interchanged. If set of discs is desired, covering complete range of ¼" to ⅜", write for information.

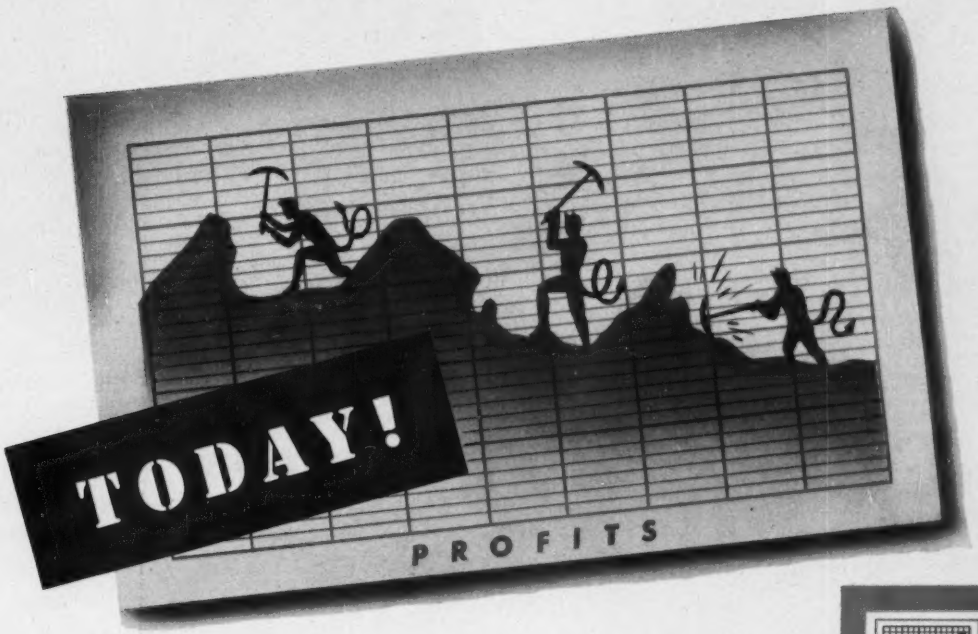
Patent Applied For

WRITE FOR DETAILED INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

WHAT YOU CAN DO

ABOUT THREATS TO PROFITS...





Most manufacturers are vitally interested in finding means to ward off or lessen outside threats to today's profits. There are few ways to do it. Consequently operations and methods within the plant are scrutinized closely for possible cost savings. Even the method of buying and replacing machinery has been studied carefully with a view toward increasing profits. As a result, machinery replacement programs such as developed by Machinery and Allied Products Institute are available to every manufacturer.

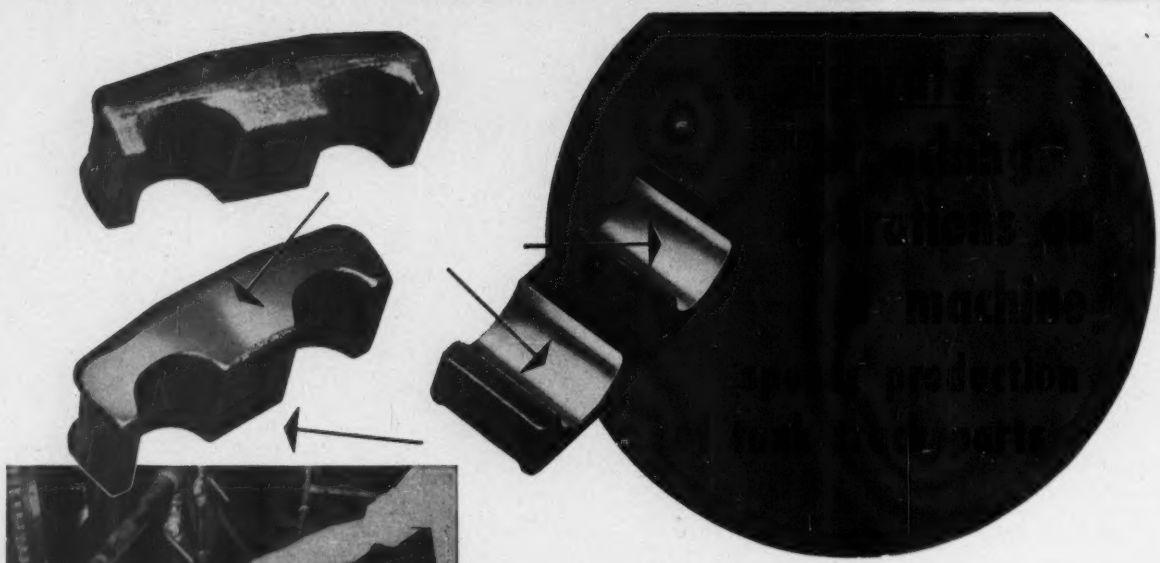
It should be profitable for you to have a machinery replacement program in your plant. True, such a program is not a panacea for all business ills, but many progressive manufacturers have found it an important and available weapon in their fight for profitable operation.

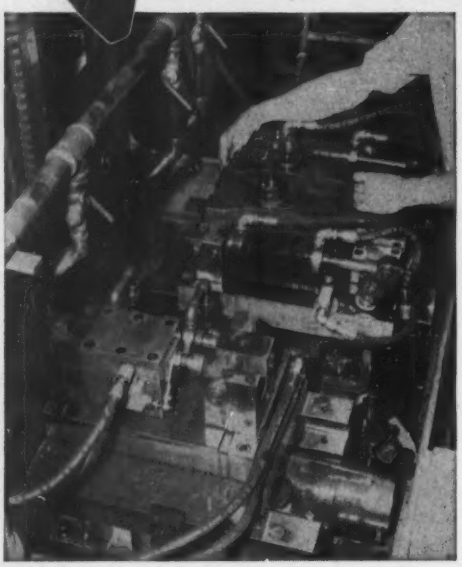
And, speaking of availability, even though the equipment you need may not be readily available, *now* is still the best time to initiate plans for a replacement program in your plant.

THE ROCKFORD INSERT GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

December, 1952





the *American* way broached these two sides and these two radii on this tank track part, at the rate of ***one part every ten seconds.*** The machine used was an American SBD 48-15 Dual Ram Broaching Machine equipped with two American-engineered fixtures, featuring automatic hydraulic clamping, and mounted on two standard receding tables which operate alternately. The left hand table holds two parts for straddle broaching the sides. The right hand table holds two parts for broaching the two radii on each part. A continuous automatic cycle permits the operator to simply load and unload the parts at one fixture while the other fixture broaches.

FULL ROUND BROACHES ADD TO ECONOMY

Full round broaches are used to broach the half rounds. They are simply rotated 180° when dull thus increasing the number of parts produced between resharpenings.

This is a typical example of the complete service you get from American Broach . . . the organization that gives you the extra advantage of experience gained in producing all three . . . broaches, machines and fixtures. For the answer to your problems just send a part-print and hourly requirements. No obligation. Address Dept. M.



For more information on the American SBD 48-15 write for Circular #300.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

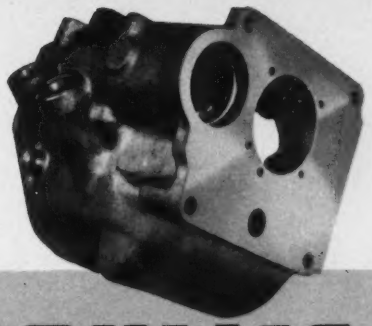
MADE IN

ROCKFORD...MACHINE TOOL SHOPPING CENTER

ILLINOIS, U.S.A.



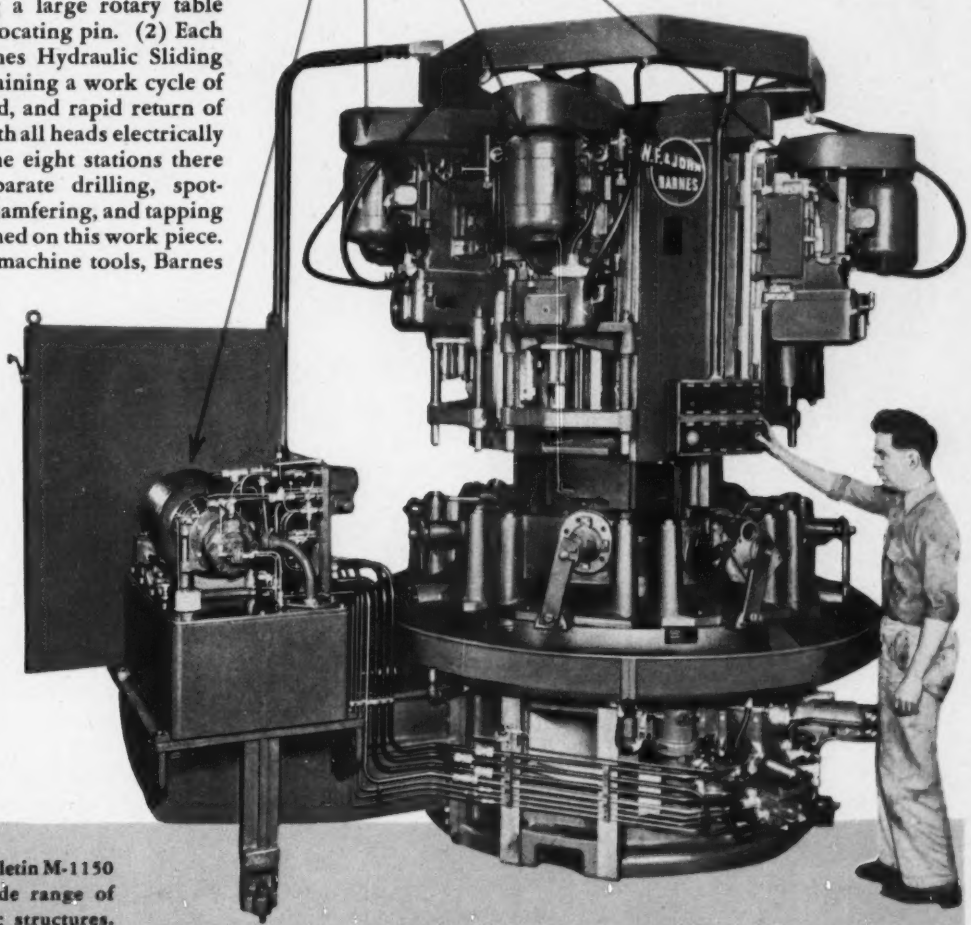
SMOOTH INDEXING AND FAST, ACCURATE PRODUCTION OBTAINED WITH



BARNES HYDRAULICS

Two types of Barnes Hydraulics are used on this multiple-operation machine for production of transmission cases. (1) At the left is a Barnes Hydraulic Fixture Unit for indexing a large rotary table and inserting the locating pin. (2) Each station has a Barnes Hydraulic Sliding Head Unit for obtaining a work cycle of rapid advance, feed, and rapid return of the tool spindle, with all heads electrically interlocked. At the eight stations there are seventeen separate drilling, spotfacing, reaming, chamfering, and tapping operations performed on this work piece. On other types of machine tools, Barnes Hydraulics have also proven their ability to perform the most difficult machining operations. Barnes experience is always available for *your* requirements.

ON A W. F. & JOHN BARNES CENTER COLUMN MACHINE



Write today for Bulletin M-1150 illustrating a wide range of Barnes hydraulic structures.

JOHN S. BARNES CORPORATION 305 SO. WATER ST., ROCKFORD, ILL.



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ROCKFORD MADE MEANS PRECISION MADE...**ROCKFORD**

ILLINOIS, U.S.A.

TOOL ROOM OR PRODUCTION—
SPEEDS FOR CARBIDE TOOLS—
MEDIUM SIZE CAPACITY—



With FEATURES AND RANGE NORMALLY FOUND IN LARGER LATHES

Usually only in larger, more costly machines do you find the combination of speeds, swing, power, feeds and threads that are standard equipment on Rockford Economy Lathes. These features make it possible to machine a wider range of work with fewer non-productive hours than is possible with many machines in its class.

Medium-sized and economy-priced, it's built to handle any job that can be turned or threaded within 16-1/2" or 18-1/2" swing, and 30" to 102" center distance. 3100 lbs. of weight, 6' bed and zero precision bearings furnish the rigidity and precision for turning out tool room accuracy.

Ask a Rockford Machine Tool Co. representative to give you full details on these machines, or write direct for our new bulletin No. 900A.

ROCKFORD ECONOMY LATHES—16" and 18"

MEDIUM-SIZED
ECONOMY-PRICED

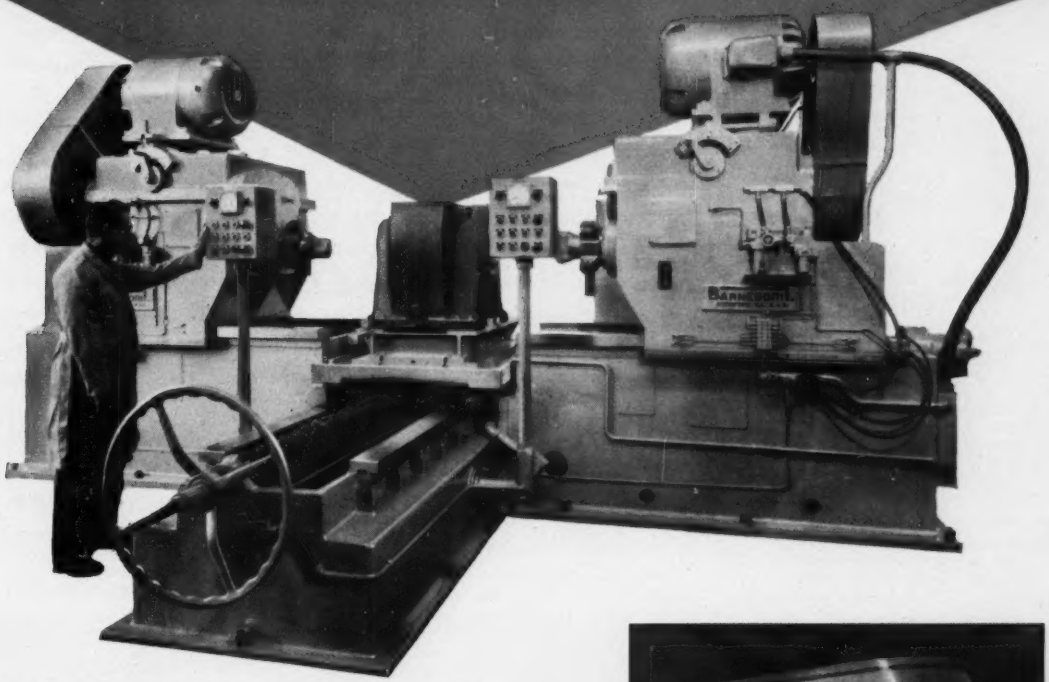
ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street, Rockford, Illinois

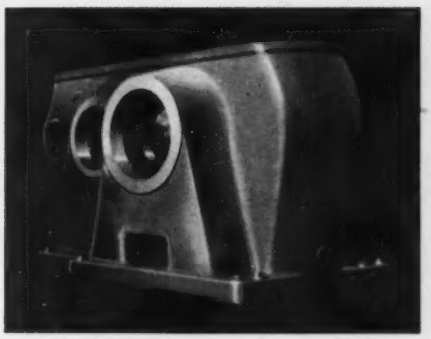
MADE IN
ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL
ILLINOIS, U.S.A.



BARNESDRIL UNIT-MACHINING

solves difficult handling and positioning of heavy castings for production boring





The size and weight of these pump reducer housings required hours of conventional machining to precision bore and face six diameters. With Unit-Type Machining, **BARNESDRIL** engineers have established these operations on a production basis.

Flexibility is one of the big advantages. Loading is simplified with an in-and-out slide. Quick-change boring is accomplished through easily adjusted locating bars and tool heads. Boring proceeds at one station, while the other is being set-up for another size. A complete range of diameters from 3-1/4" to 9-1/2" is bored and faced.

Engineered to suit your particular job requirements and desired rate of production, **BARNESDRIL** Unit-Machines eliminate many set-up operations and work-handling problems to give you fast, low-cost production.

For improved output and work-handling on machining problems, call a **BARNESDRIL** representative, or send us blueprints for estimate.

HAVE YOU A COPY—

of this new Bulletin B-150, describing **BARNESDRIL** Production-Units, their application and types of work-handling fixtures. Write for a free copy on your letterhead.



BARNESDRIL

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS



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FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD ILLINOIS, U.S.A.

THERE'S A Barber-Colman HOB

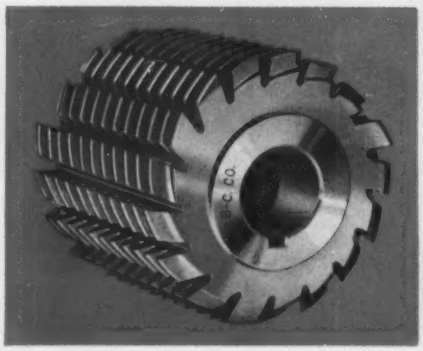
Choose from unground, ground, ultra-precision, multithread, carbide-tipped, roughing, pre-finishing or finishing hobs — made with standard or special tooth form, straight or taper bore — in a complete range of sizes and pitches. You'll find one that's designed particularly to produce your special requirements.

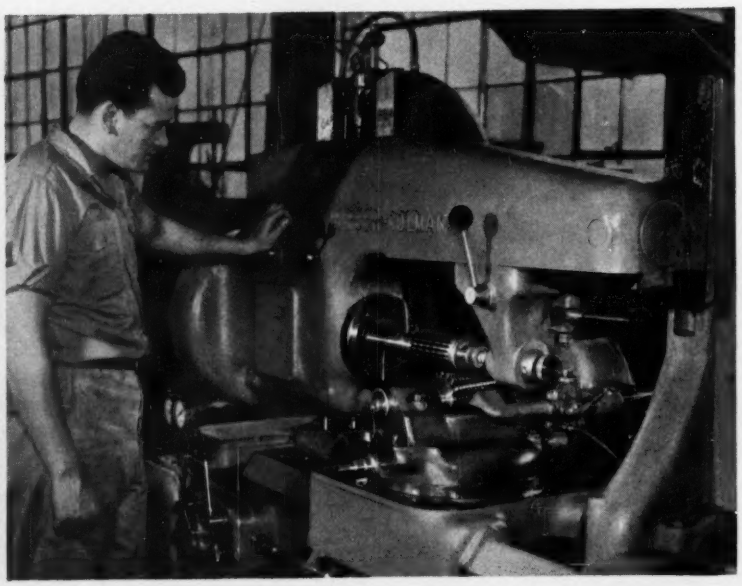
Because of more than forty years of gear cutting experience, Barber-Colman engineers can recommend tools which will best fit your requirements. They can supply gear hobs in any of the standard classes of tolerances, plus an ultra-precision class. These hobs range all the way from small 268 DP hobs to those for the largest hobbing machines, as coarse as 1 DP. With improved methods and equipment used in their manufacture, these hobs produce gear tolerances exceptional within their respective classes.

If your plant is cutting gears, you will find this Barber-Colman service the easiest, most direct and efficient approach to control of your gear quality problems. Write today for recommendations on your jobs.

Multithreads

Barber-Colman unground multithread hobs are producing good results on this semi-finishing job. Stock left for shaving is .0020" to .0025", which is normal for clean-up in shaving. Cut is 8", cutting time 10 minutes, and feed used, .100" per work revolution.





DESIGNERS OF STANDARD AND SPECIAL

MADE IN

ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT

ILLINOIS, U.S.A.



FOR EVERY ONE OF YOUR GEAR REQUIREMENTS

CLASS C ACCURATE UNGROUND

To provide the lowest tool cost per gear, Barber-Colman offers Class C Accurate Unground hobs with either standard or special tooth forms. Many users have found these hobs sufficiently accurate for pre-shaved gears, reducing tool cost considerably. Gears finished with Accurate Unground hobs are not as consistently accurate or smooth running as those finished with ground hobs. However, where these elements are not too critical, the unground form may be used for finishing. Class C Accurate Unground hobs are also available for finish hobbing of parallel-key and involute spline shafts.

Ask one of our field engineers to call, or send us blueprints showing the tolerance required. Our experienced engineering staff will recommend the most efficient hob for your job, considering accuracy, tool cost and production according to your specifications.

Carbide Tipped

Barber-Colman Carbide Tipped Hobs are designed especially for long tool life and high production requirements on non-ferrous materials.

Ground Classes

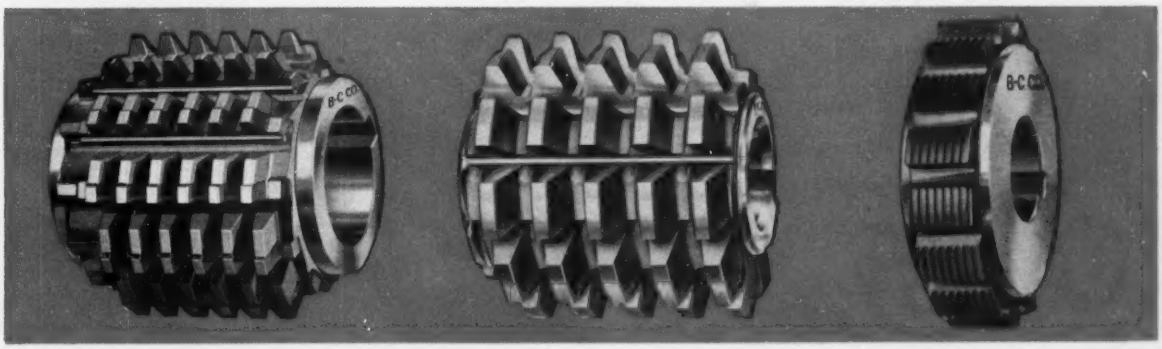
Ultra-Precision Ground
Class A Precision Ground
Class B Commercial Ground

Unground Classes

Class C Accurate Unground
Class D Commercial Unground

Fine Pitches

Barber-Colman Hobs are exceptionally accurate and are considered the best hobs available in the fine pitch class for instrument, fuse, meter and watch gears.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 722 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

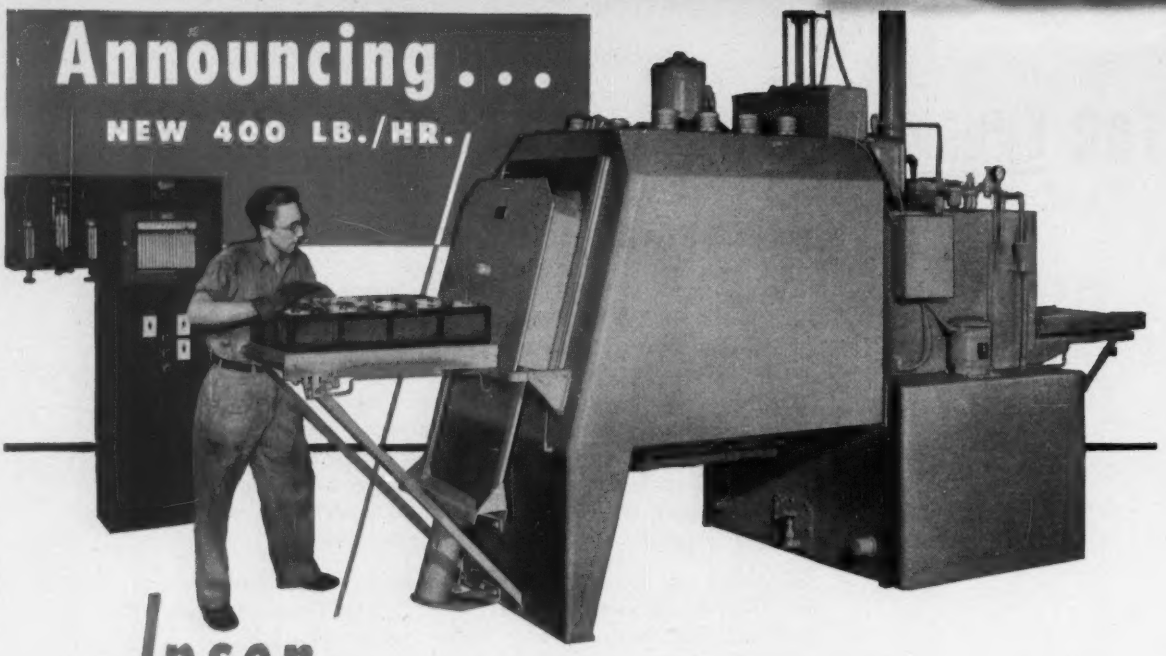
METAL CUTTING TOOLS SINCE 1908



MADE IN
CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD
ILLINOIS, U.S.A.

Announcing . . .

NEW 400 LB./HR.



Ipsen

AUTOMATIC BRIGHT HEAT TREATING UNIT . . . . .

. . . featuring 100% Forced Convection Heating

Ipsen Standard Series "T" Heat Treating Units, which have proved so profitable for industry, are now offered in additional models with 100% forced convection heating. Powerful fan forces atmosphere around radiant tubes, under the floor, and thru the work. Baffles insure complete atmosphere flow and give 100% forced convection heating.

Produce Bright, Scale-Free Work

Like other Ipsen Heat Treating Units, the new T-400 is designed to be coupled with Ipsen Washers, Generators, and Tempering Units for complete heat treating departments. All Ipsen units produce bright, scale-free work up to 1850° F.

6 ADVANTAGES OF IPSEN SERIES "T" HEAT TREATING UNITS

- **Controlled atmosphere**—in both heat and quenching chambers, reduces distortion, insures bright, scale-free work, eliminates blasting or pickling.
- **Straight-through operation**—batch processing, eliminates loading delays, extra handling.
- **Automatic processing**—assures uniform, dependable results from batch to batch.
- **Cold Chain Transfer**—assures long chain life. No load is taken by hot links.
- **Easily placed or relocated**—No pits to dig. Simple service connections complete an installation.
- **Built in standard sizes**—gas-fired or electric. Engineered for long service life, easy maintenance.

AUTOMATIC Ipsen HEAT TREATING UNITS

Write Today FOR NEW CATALOG, SPECIFICATIONS . . .
For complete information and specifications, ask for new catalog describing and illustrating complete operating details.

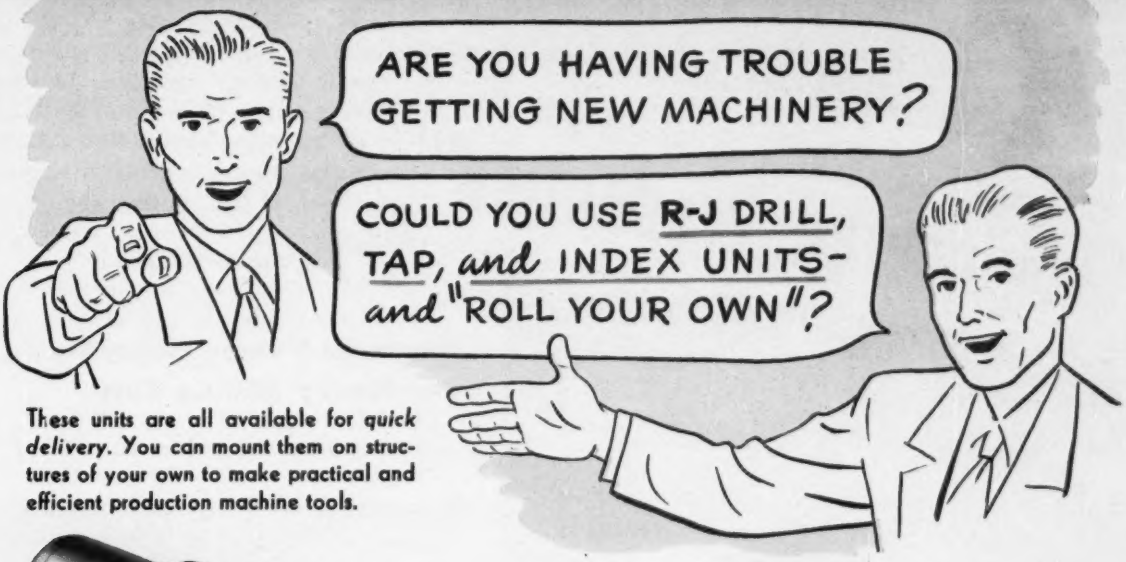


IPSEN INDUSTRIES, INC. 717 South Main Street; Rockford, Illinois
Production Units for CARBONITRIDING • CARBURIZING • HARDENING • BRAZING • MARTEMPERING

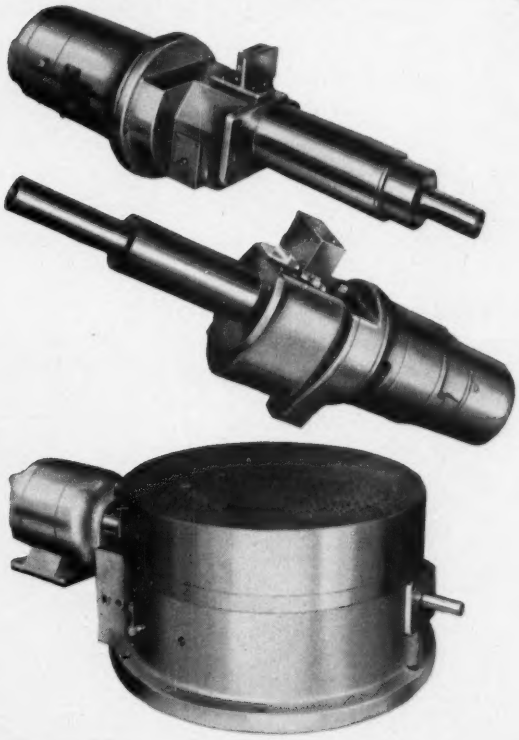
MADE IN
ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U.S.A.



Rehnberg-Jacobson



These units are all available for *quick delivery*. You can mount them on structures of your own to make practical and efficient production machine tools.



DRILL UNITS

Self-contained Drill Units are fully-automatic and cam-operated for positive quill action. They come in five sizes with drill capacities ranging from 3/16" to 1-1/2" (in mild steel).

TAP UNITS

Self-contained Tap Units are also fully-automatic with feed positively controlled by an accurate lead screw. Capacities in four sizes range from 5/16-18 and 1-1/4" stroke to 1-1/2-6 and 4" stroke.

INDEX UNITS

Complete Index Units have the new "Rim-Ball" table that will support enormous weight, and are made in 16" to 42" sizes for 3 to 12 indexes.

CONSULTATION SERVICE

If you are in doubt as to how these units might be used, or if you want details on specific applications, feel free to consult us. Over the years we have made many installations of units on Rehnberg-Jacobson production machines, and we are glad to pass along what you need of what we know.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

R-J

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... MADE IN ROCKFORD ILLINOIS, U.S.A.

You'll always get Profitable Methods plus Advanced Machine Design ... from SUNDSTRAND "Engineered Production"

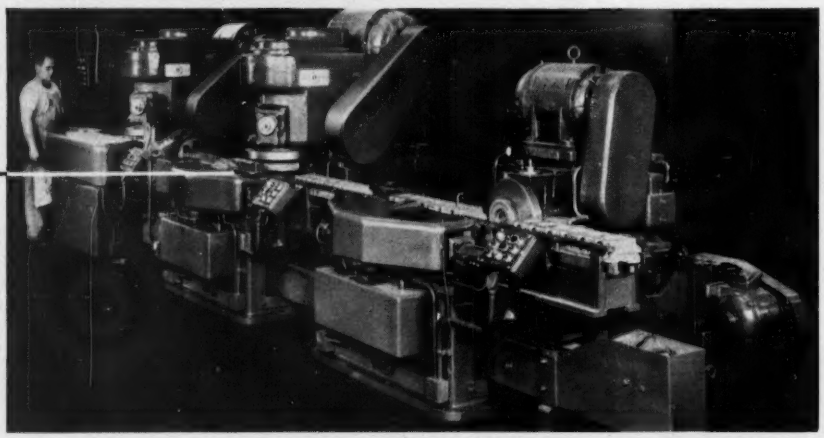
Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.

Magnetic Power Clamping For Heavy Milling Cuts



Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method. In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs of special jigs or fixtures.

Multi-Station Automatic Transfer Rigidmil



This special transfer type Rigidmil has three milling stations, one turn-over, an idle station and loading and unloading stations for milling top, bottom, and both sides of cast iron cylinder heads. This type workpiece adapts itself to automatic clamping and transfer between work stations. All stations controlled from the master control button panel or individually from the station button control panels. Cylinder heads are shuttled from station to station by the movement of the milling heads.

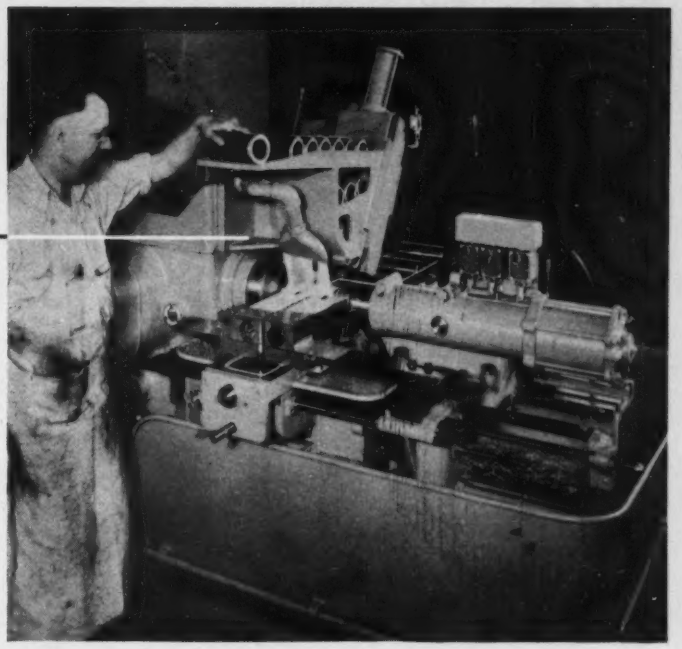
SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

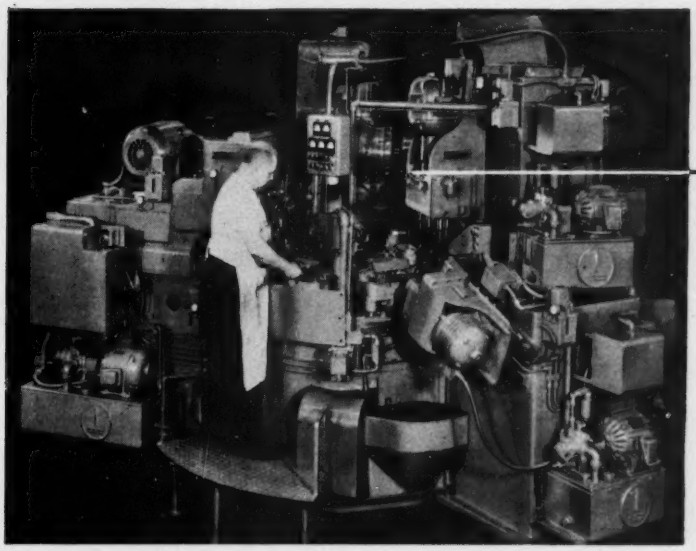
MADE IN ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



Hopper Loading for Production Turning



This standard Sundstrand Automatic Lathe is equipped with a hopper loading device for automatically loading and unloading track link bushings. The operator's only duties are to fill the hopper and the part is automatically loaded, turned and ejected into the unloading chute. Machine will run automatically with one filling of the hopper for 12-1/2 minutes.



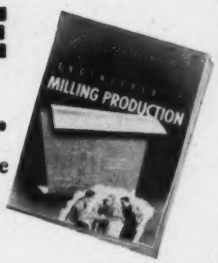
Multi-Station Automatic Indexing Machine

Special Sundstrand Five Station Process Machine for milling port faces and angle pads, drilling port faces and counterboring angle pad of manifold part. This irregularly shaped part is located and clamped at station #1 and then indexed thru the remaining four work stations to complete the machining with one handling of the workpiece. Production is approximately 115 pieces per hour.

FREE

Additional Data..

Additional data on any or all of these machines is available. For complete set of literature ask for bulletin 626.



SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2530 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

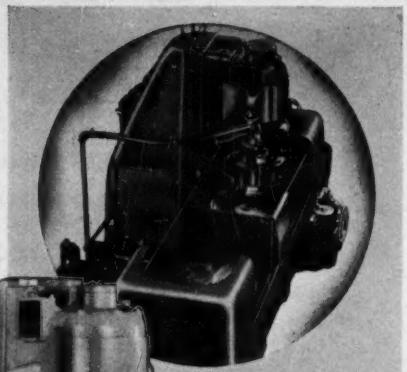


MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

Downtime BECOMES *Production Time*

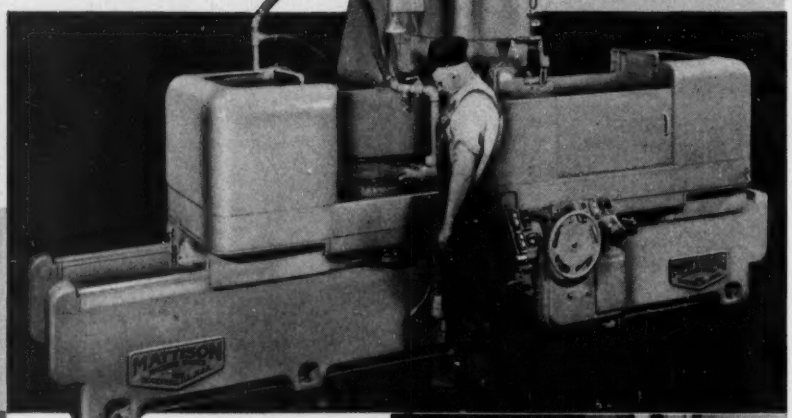
with the

NEW MATTISON DUPLEX

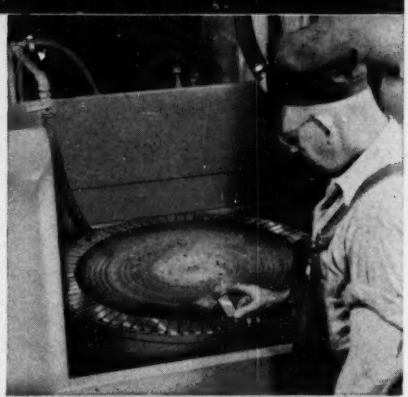


Take a look at **THIS**

~~2 Operators~~
~~2 Standard Grinders~~
~~500 Pieces~~



1 Operator
1 Mattison Duplex
500 Pieces



● That's what happened at The Ingersoll Milling Machine Co., where modern shop equipment is playing an important part in meeting greatly increased requirements for Ingersoll milling cutter blades.

They say "The pieces being ground in these pictures are Maxel steel shanks for carbide-tipped milling cutter blades.

On these particular blade shanks, .050 stock is removed on the Mattison Duplex. A wide variety of blades and shanks are ground on this machine, with stock removal ranging from .020 to .200.

The two Mattison Duplex machines which replaced three single-table standard type grinders are doing more work than the three replaced machines. By placing a single ring of blades around the outside of the 30″ diameter chuck, the operator is able to maintain continuous grinding. If more blades were put on the table at one time, the blades on the other table would be finished before he was ready to unload them.

The time saving in rough grinding these blades on the new Duplex machines is 50 per cent, compared with the old machines. In other words, 500 blades can be produced in half the time formerly required. Greater power and faster action account for some of this difference.

The new Mattison Duplex Grinder is really two machines in one, being equipped with two rotary tables or chucks instead of one. On many classes of work, one operator with this machine can turn out as much work as was formerly done by two machines and two operators. See example to the left. Downtime is practically eliminated.

An analysis of your grinding work will very likely disclose many jobs that could be very profitably handled on a Mattison Duplex. For further information write for a free copy of 145-3RM our new circular on this machine.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

MADE BY

ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS

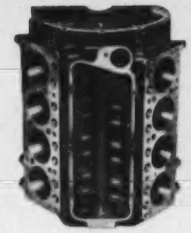
ILLINOIS, U.S.A.



Performs 180 operations in 43.5 seconds. Drills, spot-drills, rough-bores, c'bores, c'sinks, and reams. Includes 360° rotating fixture for removal of chips at station No. 11, and automatic gauge of drilled holes at station No. 17.

UNIT No. 1





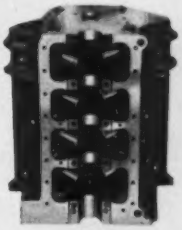
Capacity...

80!

CYLINDER BLOCKS AN HOUR

379!

OPERATIONS



GREENLEE

TRANSFER MACHINES

When you see these big Greenlee transfer machines working — turning out a tremendous quantity of work so smoothly and easily — you realize the qualities that make them great. Here is power, precision, durability, and a vast multiplicity of operations in a compact, integrated production line. Here is modern mass-production for component parts in its most successful form.

Concrete evidence of our experience and capability in designing and building Transfer Machines is exemplified with installations like this three-unit production line, now at work for a leading automotive concern.

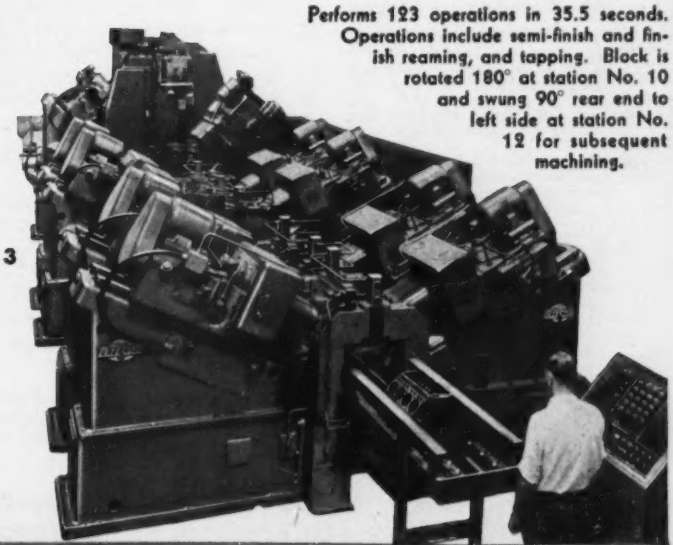


UNIT No. 2

Performs 76 operations in 43.8 seconds. Drills, c'sinks, c'bores, and trepans. Tilts part at station No. 1 to 180° for subsequent machining. Automatically gauges and cleans drilled holes at station No. 20.

Performs 123 operations in 35.5 seconds. Operations include semi-finish and finish reaming, and tapping. Block is rotated 180° at station No. 10 and swung 90° rear end to left side at station No. 12 for subsequent machining.

UNIT No. 3



PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO. 1872 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

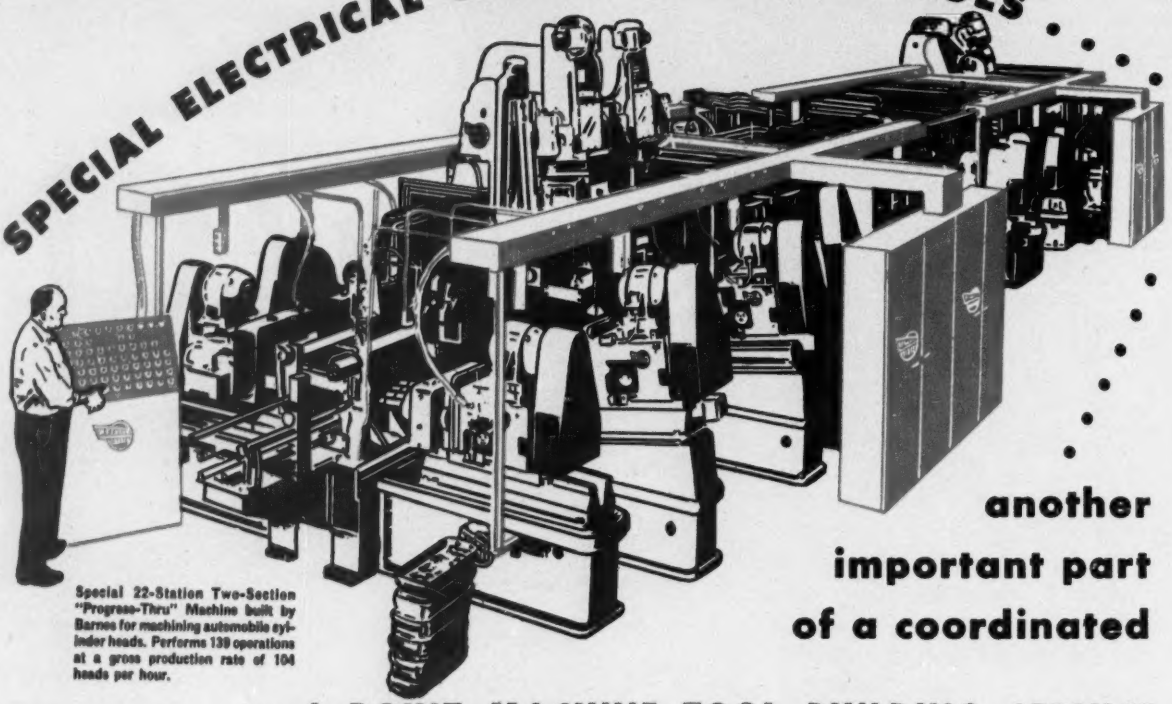


MADE IN

YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCKFORD

ILLINOIS, U.S.A.

SPECIAL ELECTRICAL CIRCUITS and CONTROLS



Special 22-Station Two-Section "Progress-Thru" Machine built by Barnes for machining automobile cylinder heads. Performs 139 operations at a gross production rate of 104 heads per hour.

another important part of a coordinated

6-POINT MACHINE TOOL BUILDING SERVICE by W. F. & JOHN BARNES

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES . . .

1. SPECIALIZED MANUFACTURING FACILITIES — 75 year background, large well equipped plant efficiently tooled to produce high production machines.
2. SPECIAL HYDRAULIC EQUIPMENT — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. SPECIAL GAUGES, FIXTURES, TOOLS — designed for each individual machining problem, assure accuracy of operations at high production speeds.
4. SPECIAL ELECTRICAL EQUIPMENT and CONTROLS — as illustrated above.
5. SPECIAL HANDLING AND CONVEYOR EQUIPMENT — designed and built to reduce work handling, effect maximum safety and efficiency.
6. COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

Designed and Built to Simplify Operations

Providing special electrical circuits and controls is another important part of the coordinated 6-point machine tool building service rendered by Barnes. The example shown above partially illustrates how this equipment is assembled to provide easy maintenance, maximum safety, and simplicity of operation. Inter-locking circuits make the sequence of operations automatic, fast, and sure. Safety devices are incorporated to suit each job which detect and signal danger conditions and prevent costly repairs of machine or tools. Controls are provided which minimize human effort. Separate control stations permit individual head operations to speed tool changes. Wiring is according to JIC standards.

Undivided Responsibility Assures Better Service

Because all planning, engineering, and manufacturing efforts at Barnes are closely coordinated, you get a complete machine tool building service all from one convenient, dependable source. Broad, varied engineering experience and creative skills have been developed over the years which enable Barnes to help you solve many troublesome production problems. If your present or future machining needs call for faster, more efficient methods, we will be glad to work with you as rapidly as current conditions will permit.

W. F. & JOHN BARNES

Write for Free Data Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.



W. F. & JOHN BARNES COMPANY
310 S. WATER ST., ROCKFORD, ILLINOIS

MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.





tool steel is the apple of our eye!

We're especially proud of our tool steels . . . because users rate them tops in the field. In fact, users think so highly of them, they've made Crucible the country's number one producer of these fine steels.

We like this enviable position. Thus, we make sure our research and development keeps step with industry's need for new, improved tool steels. You, too, can profit from our long experience by taking advantage of our metallurgical service. You are assured of prompt delivery of your requirements from our fully-stocked warehouses, strategically-located throughout the country.

SEND TODAY for the unique Crucible Tool Steel Selector—a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
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SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

Crucible Steel Company of America
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Name_____

Company_____ Title_____

Address_____ City_____ State_____

9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.



Jigs and Fixtures are easier to machine– easier to handle when made of **Aluminum.** Investigate the **Substantial Savings** possible with **Alcoa** Tool and Jig Plate.*

- Moderately priced.
- Strain relieved—machined both sides.
- Tolerances on plates of thicknesses from ½" to 4" held within ± .010".
- Available from stock up to 48" x 96". Immediate delivery.

**For more information on Alcoa Tool and Jig Plate, contact your local Alcoa sales office... or write ALUMINUM COMPANY OF AMERICA, 1951-M Gulf Building, Pittsburgh 19, Pa.*

ALCOA

TOOL AND JIG PLATE

Tool Steel Topics

BETHLEHEM STEEL

How Reducing Tool Hardness Tripled Output

A container manufacturer had been using several different grades of tool steel for rolls used to seam 18-gage sheet steel. The rolls didn't hold up very well. Asked to study the problem, we recommended our A-H5, a 5-pct-chromium, air-hardening grade.

But in treating the rolls the customer proceeded on the principle that a very high hardness would give longest wear—and hardened them accordingly. As a result they failed prematurely, due to breakage caused by inadequate shock-resistance.

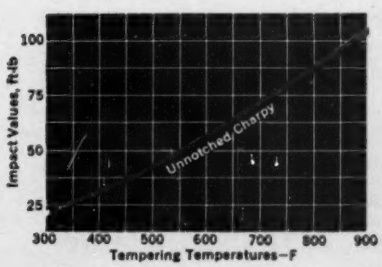
So we made the following recommendations for heat-treatment, asking that they be followed exactly: quench in oil at 1750 F, cool down to 1000 F, air-cool to 150 F, then temper for four hours at 1000 F and again at 950 F. This treatment produced a surface hardness of about Rockwell C-57.

"Not hard enough!" said the customer.

"Give it a trial," we urged.

The first roll so treated lasted nearly twice as long as any previous roll, making 58,000 seams on one groove with very little evidence of wear. A second roll made nearly 100,000 seams!

A tool that's close to its maximum hardness is likely to be brittle. And tools wear too rapidly if hardness is low. That's why most production tools and dies are treated so as to get an ideal compromise between hardness and toughness.



HARDNESS VS. TOUGHNESS — This curve shows how the impact-resistance of a carbon tool steel increases as the hardness is reduced by higher tempering temperatures.



Our modern mill depot is geared for fast shipments of tool steel to distributors everywhere. A wide selection of sizes is stocked in 22 grades of steel.

TOOL STEEL...WHEN YOU WANT IT!

Distributors of Bethlehem tool steel are ready to fill your tool-steel orders from their local stocks . . . in strategic cities throughout the country. Our own mill depot at Bethlehem, Pa., is completely stocked with several thousand sizes of 22 different tool-steel grades for quick shipment to our distributors and to mill customers. Whether you need one short bar or a carload, you can count on fast delivery when you specify Bethlehem.

Our complete line includes: carbon and carbon-vanadium, oil- and air-hardening, shock-resisting, hot-work, high-speed steels . . . and steels for die-casting dies, plastic molds, brake dies and other special applications.

And remember — Bethlehem metallurgists are on call whenever you have tool-steel problems.

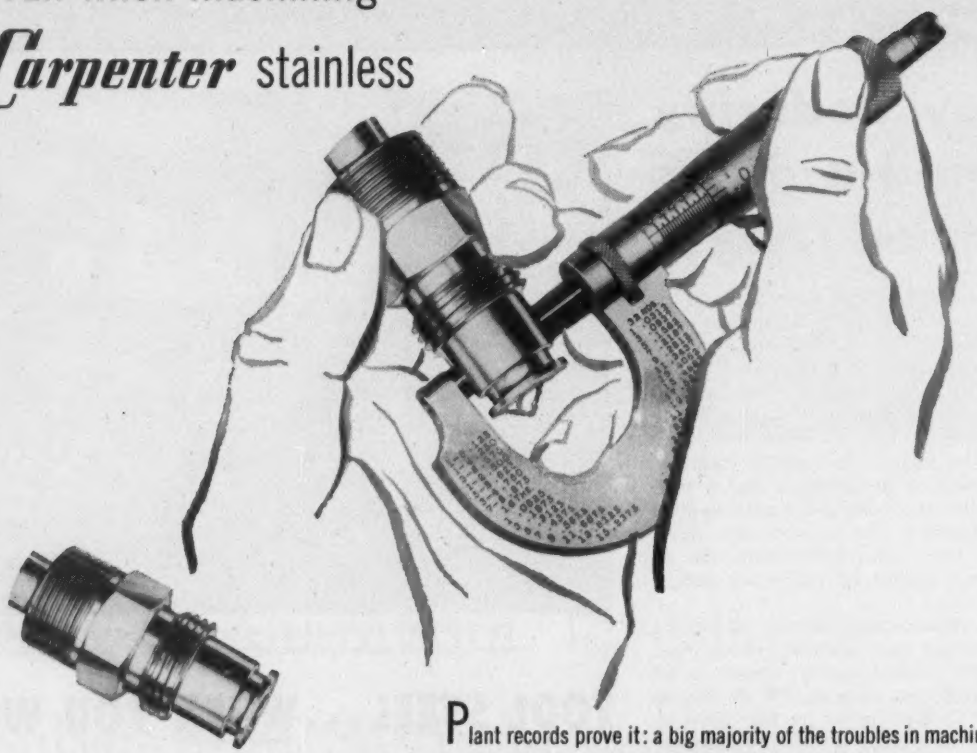
HEAVY-DUTY PUNCH

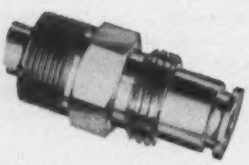
Made of our 67 Chisel, this punch forms parts from .185-in. sheet steel in a 300-ton hydraulic press. The punch must take a lot of shock; and that's why this chrome-tungsten tool steel stands up so well. It's hardened to Rockwell C-58.

The lower die, hardness Rockwell C-61, is made of Lehigh H—our popular grade of high-carbon, high-chromium steel. About 5000 pieces are produced on this heavy-duty job before redressing is required.



You get a far higher number of **good ones** on each run when machining *Carpenter* stainless





Rejects on this needle valve part dropped 30% when the company changed to Carpenter No. 8, Type 303.



Plant records prove it: a big majority of the troubles in machining stainless parts just aren't necessary! That's why we'd like to show you what can happen when you change from a run-of-the-mill free-machining stainless to a Carpenter Free-Machining grade. Records prove that on many jobs, rejects take a nosedive, tool life goes up, and costs down. That's because Carpenter Stainless is made in a specialty tool steel mill to highest tool steel quality standards. The same careful controls are applied to make sure every bar of Carpenter Stainless will work the same. It stands to reason that with Stainless like this you can get more good parts out of the lot. Isn't it worth a try? Just specify "Carpenter" on your next production order. The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Carpenter STEEL

Free-Machining Stainless

takes the problems out of production

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

TOUGH PRODUCTION ASSIGNMENT?



You should know about

CHASE® PHOSPHOR BRONZES



Chase Phosphor Bronzes do an outstanding job where metal must stand up under rugged use.

They resist wear and have high fatigue strength. They are extremely ductile and resilient. And, of course, they have excellent resistance to corrosion.

Characteristics like these make Chase Phosphor Bronzes suited for a wide variety of uses—from bearings and diaphragms to heavy duty springs and valve parts.

Chase metallurgists and engineers check carefully on surface finish and internal characteristics to make sure that every lot of Chase Phosphor Bronze Rod, Strip or Wire is up to the usual high Chase standards. Send coupon for further information.



FREE Folder gives tables of Chase Phosphor Bronze properties (hardness, tensile, fabrication, physical) as well as uses and forms.

Chase® BRASS & COPPER

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Chicago	Houston†	Newark	Rochester†	(†sales office only)
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Chase Brass & Copper Co., Dept. MACH-1252
Waterbury 20, Conn.

Please send me the free folder on Chase Phosphor Bronzes.

Name_____

Position_____

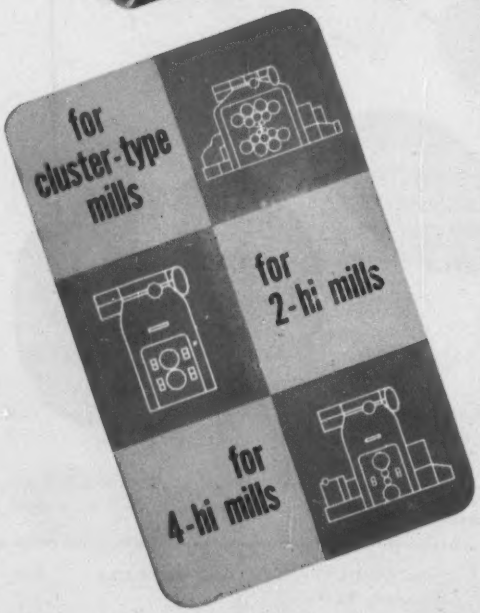
Company_____

Street_____

City_____ State_____

WORK ROLLS WITH THE *MAGIC* TOUCH . . .





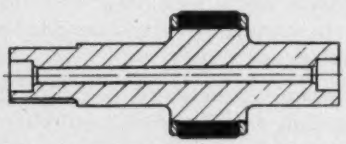
● Here's the magic key to improved surface finish, more uniform gauge and closer tolerance on all types of cold-rolled metal strip. Whether you require an ultra-mirror finish or just a plain, smooth surface—work rolls of Talide (Tungsten Carbide) are the answer. Only Metal Carbides has the know-how and experience to produce carbide rolls from 1 pound laboratory size up to 1,000 pound production mill rolls.

Long-lasting Talide Rolls, made of the world's hardest metal, step up mill production and reduce scrap and rejects. They last 25 to 50 times longer between grinds, and can be reground twice as many times as ordinary rolls. They impart improved physical properties to the strip, reduce plating costs, and eliminate the need for subsequent polishing operations.

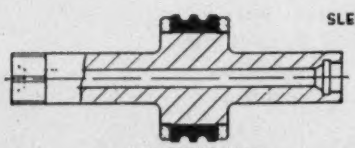
Over 50 mills are now using Talide Rolls for rolling cold-rolled, copper, brass, stainless, spring steel, razor steel, alloys, carbons, aluminum foil, tinsel ribbon, flat and shape wire.

Talide Rolls are designed to help the metalworking industry produce more efficiently—in less time—at lower cost.

Send for Catalog CR-50



SLEEVED ROLLS FOR FLAT WIRE



FOR SHAPE WIRE

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN, OHIO.

METAL CARBIDES CORPORATION

YOUNGSTOWN 7, OHIO

SINTERED CARBIDES • HOT PRESSED CARBIDES
CUTTING TOOLS • DRAWING DIES • WEAR RESISTANT PARTS

OVER 25 YEARS EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

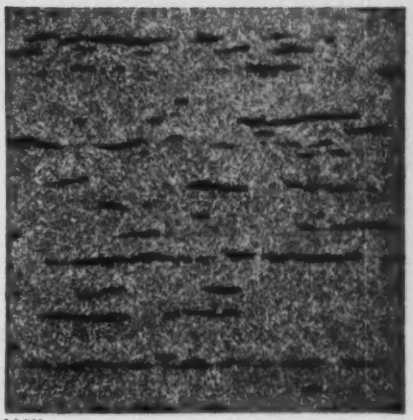
TESTS PROVE GRAPH-MO® BEST STEEL FOR GAGES!

Reports from users show Graph-Mo steel outwears other tool steel 3 to 1!

Graph-Mo® steel is today's big news for gage users and gage makers. The difference between Graph-Mo steel and other gage steels is so real you can see it—in the form of tiny, scattered, parallel marks barely visible on the surface of a polished piece of Graph-Mo. It's the "graphitic look"!

These marks indicate the presence of free graphite in the steel's structure. And this free graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other tool steels an average of 3 to 1 according to reports from dozens of gage users. Tests prove Graph-Mo is also the most stable gage steel ever made. (see below).

Photomicrograph at right shows the free graphite and diamond-hard carbides that give Graph-Mo unusual wear resistance. They minimize scuffing, pick up and galling, and resist abrasion. Graph-Mo machines 30% faster than other tool steels, gives uniform response to heat treatment, and is available *now!*



100X



12-year stability test proves Graph-Mo steel master gage stays within 10 millionths of its original dimension

Here's proof of Graph-Mo's outstanding stability. These measurements were taken on a typical Graph-Mo steel master plug gage over a 12-year period. They show only 10 millionths of an inch change after that time.

1940—1.73996 *1941*—1.73995 *1942*—1.73998 *1943*—1.73997
1944—1.73996 *1945*—1.73995 *1948*—1.73997 *1951*—1.73995

You can always tell Graph-Mo by its "graphitic look". This built-in "trade-mark", the result of the free graphite in its structure, can't be duplicated in other steels. Look for it, next time you buy gages. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

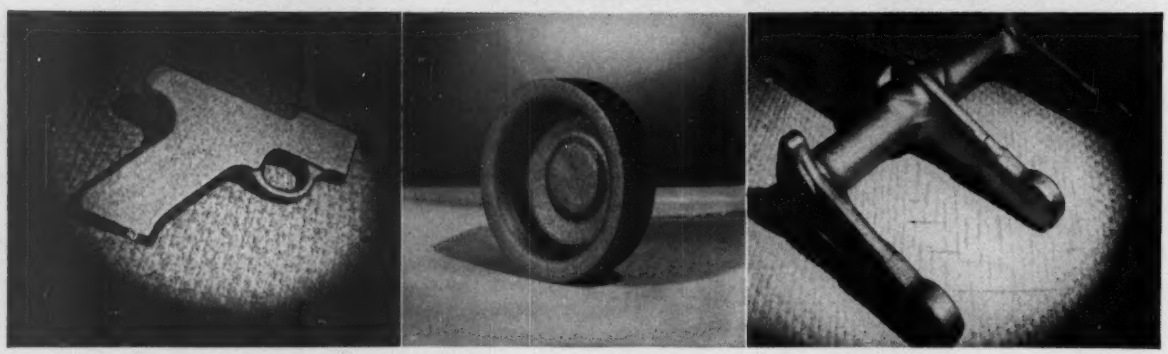


SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



Jot it down

BETHLEHEM *for* DROP FORGINGS



Our regular customers know we make drop forgings—good ones. But maybe you're with a company that hasn't yet tried our services. If so, jot us down on your "Where to Buy" list. We'd like to do business with you.

Bethlehem has much to offer. The necessary steel; a fine, well-equipped die shop; hammers, mechanical presses; heat-treating equipment; full metallurgical service to double-check quality.

We're an experienced firm; been making closed-die forgings for many years. These have included a wide range of designs for the oil, mining, aviation, automotive, electrical, and other types of industries. Call or write us, won't you? We'll bend over backward to meet your requirements and do a good job for you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL



Ask ALCOA about threading and tapping aluminum screw machine stock

Cutting threads in aluminum is easy if you follow simple procedures of alloy selection, tool preparation and machine setup.

Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

Taps and dies remove a large amount of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part near the tolerance limit favoring the removal of the least amount of metal.

Both taps and dies should have a top rake angle ground on the leading edge of the tool. On some jobs, both taps and dies will cut better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. Tap flutes should be highly polished. Tap lands should be relatively narrow to reduce friction between the tool and the work.

Your local Alcoa sales engineer will gladly answer your questions on machining, alloy selection and finishing. You'll find him listed under "Aluminum" in the classified phone book.

ALUMINUM COMPANY OF AMERICA
870-M Gulf Building · Pittsburgh 19, Pennsylvania



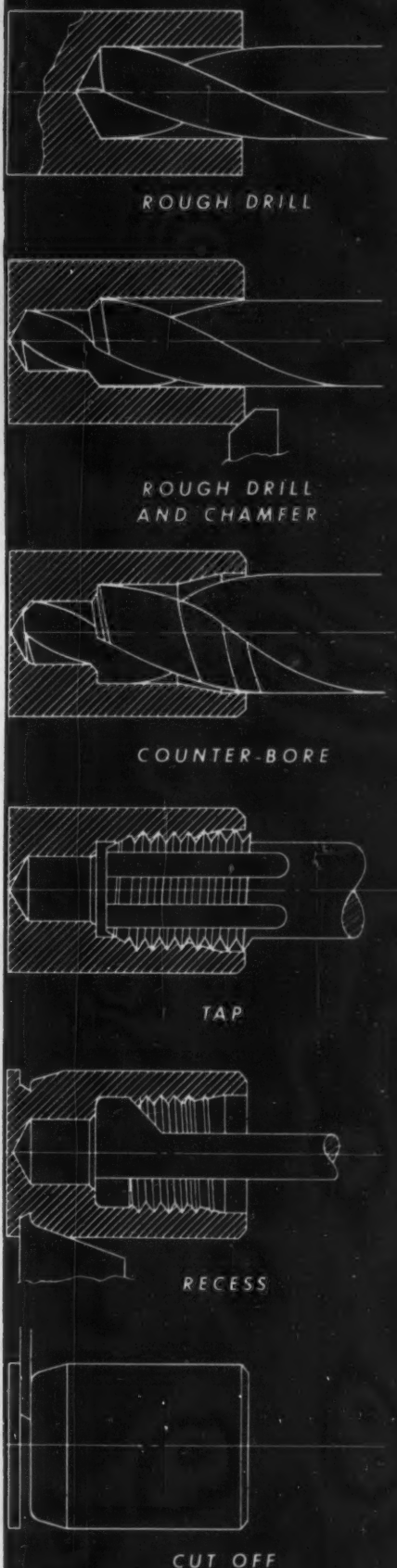
ALCOA OFFERS TWO BOOKS — *Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

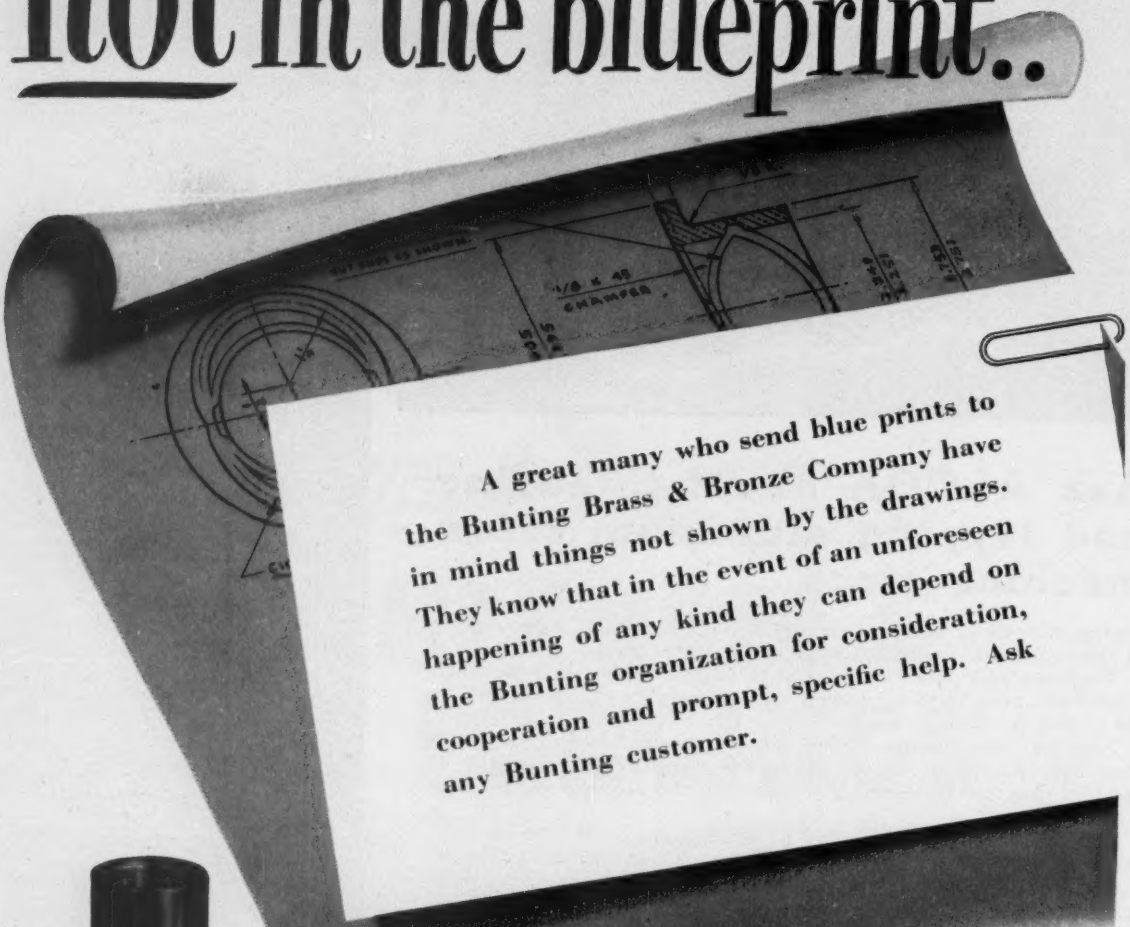
ALCOA

ALUMINUM SCREW MACHINE STOCK

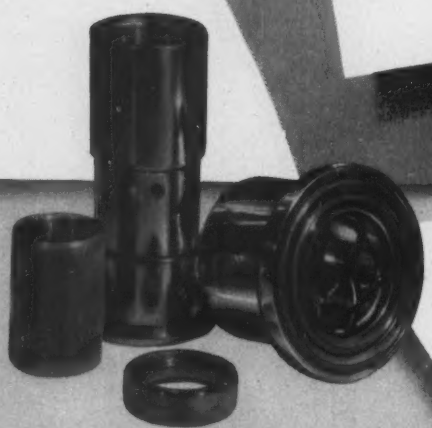
"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.



not in the blueprint..



A great many who send blue prints to the Bunting Brass & Bronze Company have in mind things not shown by the drawings. They know that in the event of an unforeseen happening of any kind they can depend on the Bunting organization for consideration, cooperation and prompt, specific help. Ask any Bunting customer.



The sleeve bearing is not complex in structure; it conforms readily to design requirements; it is easily installed. Cast Bearing Bronze is the most adaptable of all sleeve bearing materials; it possesses excellent anti-friction properties. With proper film lubrication, its coefficient of friction is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We ask the opportunity to work with you, and to quote on your requirements.

Bunting®

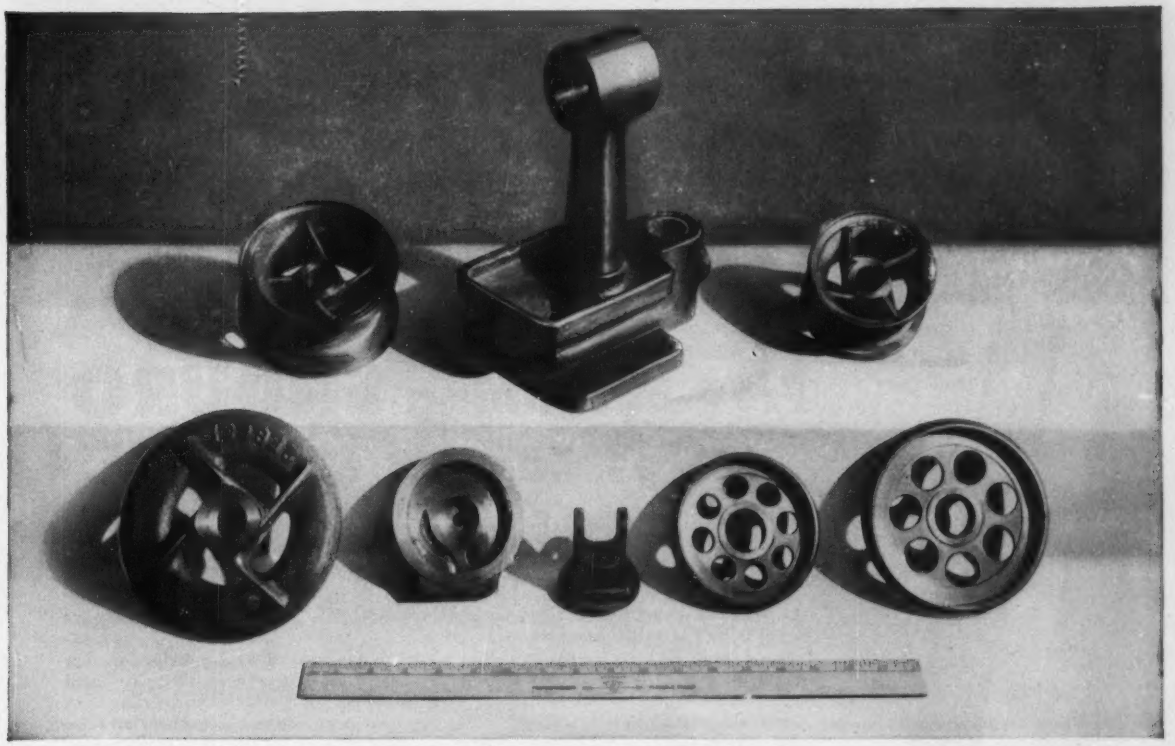
BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

NISILOY*

to eliminate hard chilled areas in gray iron castings

. . . REDUCE machining time, tool wear, rejections



Produce *machinable* gray iron castings regardless of sharp variations in section thickness . . .

Eliminate localized hard areas or chilled (white) edges and surfaces . . .

Reduce machining time, tool wear and rejections . . . *raise both quality and quantity of your output by controlling gray iron structure with small ladle additions of NISILOY.*

Designed specifically to promote better machinability, NISILOY is a powerful innoculant and graphitizer containing about 60% Nickel, 30% silicon, balance essentially iron.

*Trade Mark of The International Nickel Company, Inc.

Mail the coupon now . . . for your *free* copy of a booklet that describes how Nisiloy helps you improve structure and machinability of gray iron castings.

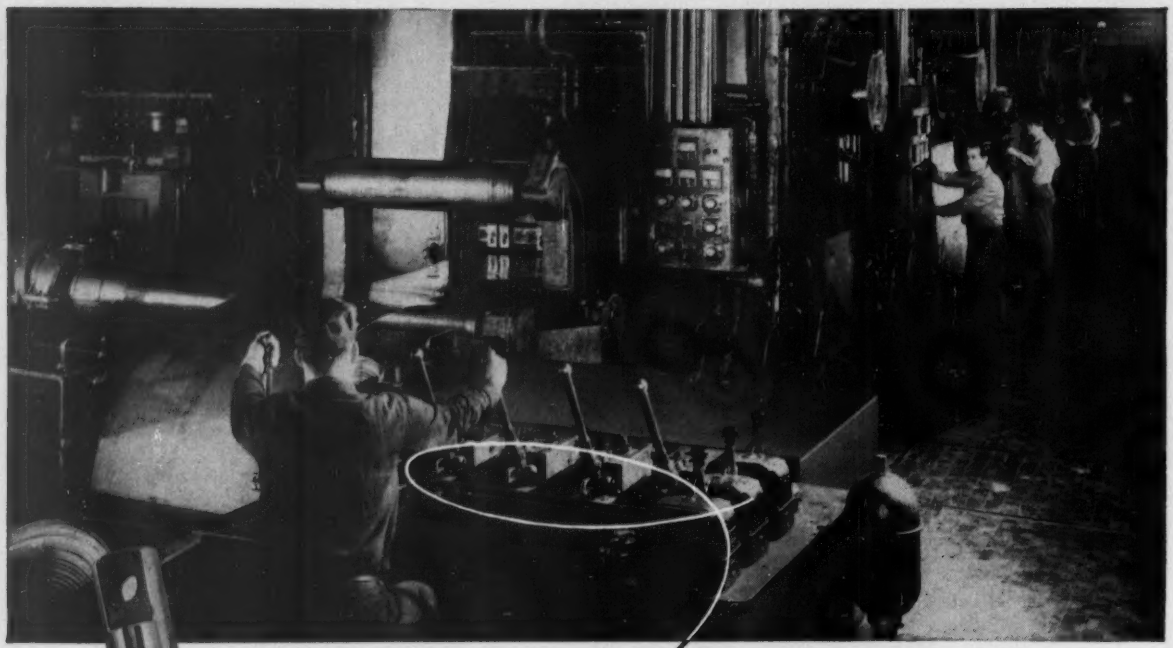
EMBLEM OF INCO SERVICE
TRADE MARK

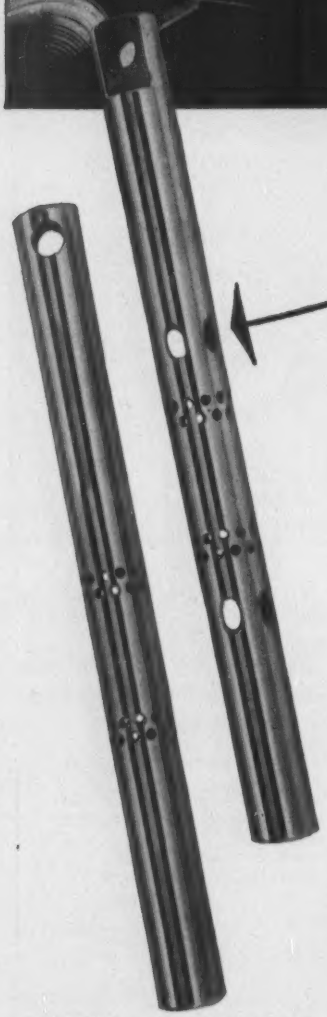
THE INTERNATIONAL NICKEL COMPANY, INC.
Department 20, 67 Wall Street, New York 5, N. Y.

Please send me your booklet entitled,
"NISILOY" for GRAY IRON CASTINGS.

Name.....*Title*.....
Company.....
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City.....*State*.....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.





Half-inch and three-quarter-inch plungers for Hunt "Quick-As-Wink" control valves are machined from Type 416 Free-Machining ENDURO Stainless Steel by C. B. Hunt & Son, Inc., Salem, Ohio.

Free-Machining ENDURO Helps Control Stainless Machining Costs

In pneumatic and hydraulic control valves, ENDURO Stainless Steel plungers help boss big mills like this . . .

The ENDURO plungers—through which air, water, and oil flow under thousands of pounds pressure — must resist corrosion, resist abrasion, and maintain a tight seal at all times. They must be fully balanced so that they cannot creep or crawl.

All this requires a lot of machining . . . upwards of 30 separate operations.

Free-Machining ENDURO Bars are cold finished by Republic's Union Drawn Division especially for efficient, economical production of all such highly-machined parts. They provide close tolerances, accuracy of section, uniform soundness, and fine surface finish, together with the high physical and chemical properties of stainless steel. Two grades are 90% as machinable as Bessemer screw stock.

Free-Machining ENDURO also is available in hot rolled bars, and in wire. Republic metallurgists are ready to give prompt assistance on applications, processing and use. Write:

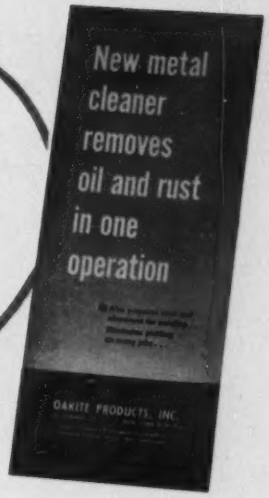
REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
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Republic ENDURO®
FREE-MACHINING
STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Have you tried this acid-detergent method for removing rust and oil at the same time?



Here is what users are saying about Oakite Compound No. 33

MICHIGAN: "Removing rust for less than 9 cents per wheel; sand blasting cost 25 cents."

TEXAS: "Eliminates practically all rejects and also handwiping of booster caps."

NEW YORK: "Have never seen such clean parts with such perfect paint adhesion . . . Putting Oakite Compound No. 33 in specification sheets for sub-contractors on these registers."

ILLINOIS: "Works a miracle taking heavy rust off steel cabinets."

PENNSYLVANIA: "Well pleased with removal of drawing compound, heat scale, rust and oil. Parts coming through good and clean."

CALIFORNIA: "This material is a beauty . . . one we've been waiting for on this jeep overhaul job."

MICHIGAN: "Removes oil, rust and scale faster . . . Increases adherence of rubber to steel for motor mounts and bumpers."

MASSACHUSETTS: "Removed carbonized smut and scale from rocket parts perfectly in 8 minutes."

MISSOURI: "Results very good. All corrosion removed from battery connectors."

OHIO: "Eliminated one wiping operation . . . Paint really sticks on metal caskets."

NEW YORK: "Beautiful job . . . Removes residues from steel transformer cases . . . eliminates one operation. Delighted with saving. . ."

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada

Metal craftsmen using Oakite Compound No. 33 say it is just what they've been looking for: a metal-cleaner that combines three important operations into one:

1. **It removes rust** *at the same time that*
2. **It removes oil** *at the same time that*
3. **It prepares the metal for painting**

Oakite Compound No. 33 removes rust, heat scale, tarnish, other oxides, stamping and forming oils, rust preventives, carbon smuts, soldering and welding fluxes, identification inks and similar soils. It develops excellent paint adhesion on steel, cast iron, aluminum sheet and castings.

For Use in Tanks or by Hand—Oakite Compound No. 33 is great for soak-cleaning metal parts of moderate size; and great for hand-swabbing on large metal surfaces.

Often Avoids Pickling—Oakite Compound No. 33 removes rust and oil so successfully that it frequently eliminates the need for a cycle of separate cleaning, pickling, neutralizing and paint-conditioning operations. It saves money in many ways.

FREE For a copy of "*New metal cleaner removes oil and rust in one operation*"—describing the use of Oakite Compound No. 33—just drop us a note or mail the coupon.

OAKITE PRODUCTS, INC.
26 Rector St., New York 6, N. Y.

Send me a FREE copy of "*New metal cleaner removes oil and rust in one operation*"
Also, send me information about Oakite methods for the following jobs:

- ☐ Tank cleaning
- ☐ Electrocleaning steel
- ☐ Electrocleaning nonferrous metals
- ☐ Machine cleaning
- ☐ Pickling
- ☐ Steam-detergent cleaning
- ☐ Pre-paint treatment
- ☐ Paint stripping
- ☐ Burnishing
- ☐ Rust prevention

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CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

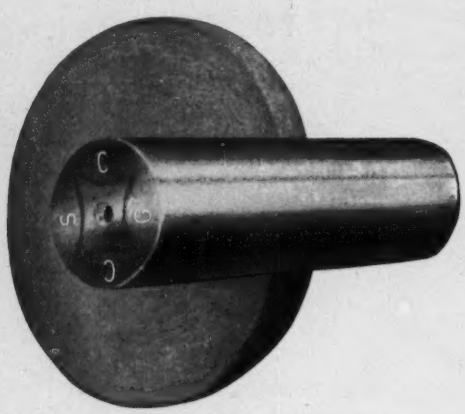


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his dairy, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

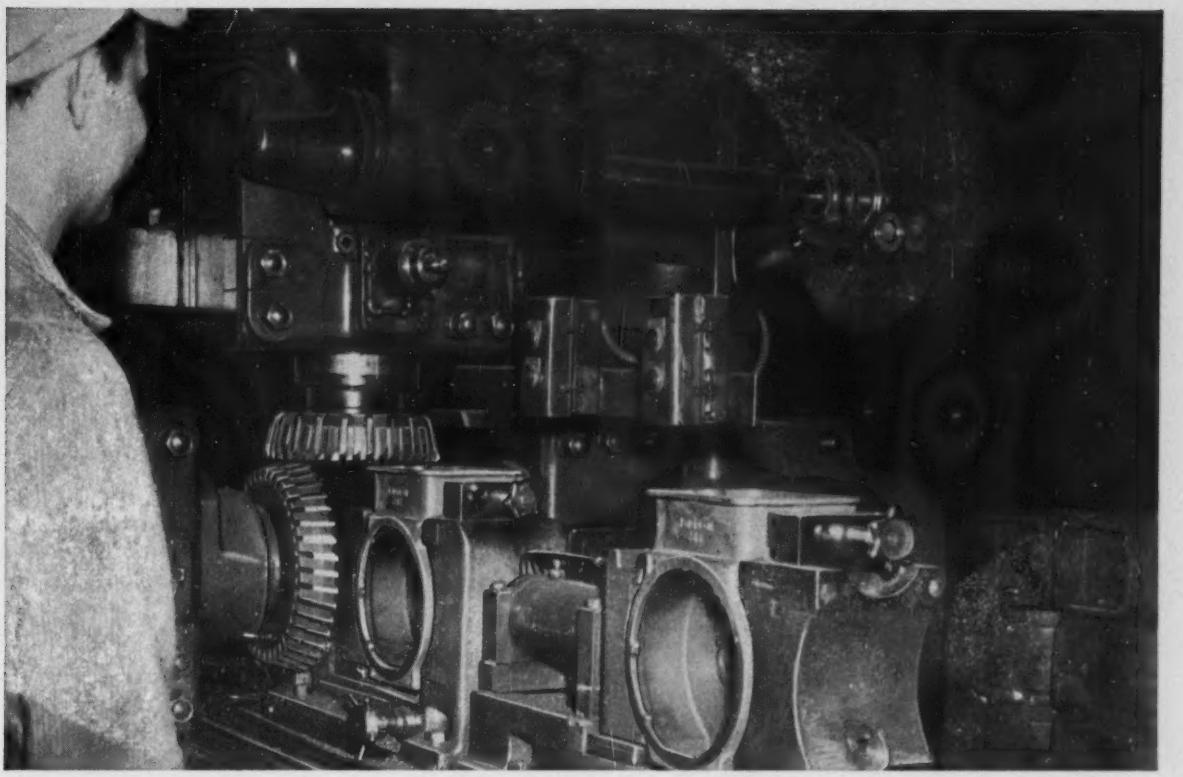
IMMEDIATE BARS

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CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 **INCORPORATED 1892**



450 pieces per grind...

Despite Vibration

HAYNES STELLITE alloy milling cutter blades are being used successfully to machine gas-meter bodies, despite considerable vibration. The meter bodies have thin walls with respect to their other dimensions, and even though they are held in a rigid fixture, vibration cannot be completely eliminated. HAYNES STELLITE alloy tools have the toughness to withstand the chatter and also the red hardness to do the job fast.

Three milling heads, each containing 36 standard HAYNES STELLITE blades, face the flange at the top of the meter and straddle mill the two sides simultaneously. The tools previously used produced as few as 14 pieces per grind. HAYNES STELLITE tools produce an average of 450 pieces.

For information on how to use HAYNES STELLITE tools on your machining jobs, write for the new manual, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES TRADE-MARK *alloys*

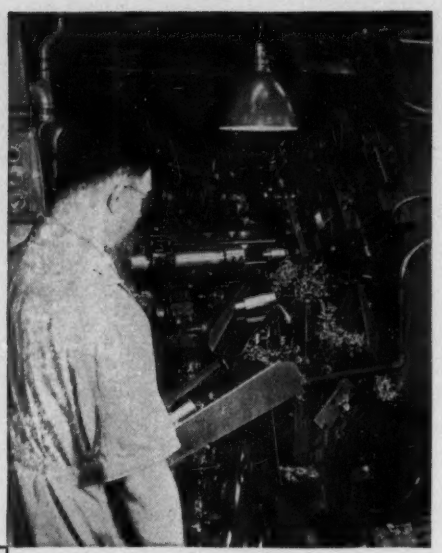
Haynes Stellite Company
A Division of
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"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

This steel bar

MACHINABILITY

puts parts in the pan...fast!



• Automatics hum a steady tune of *production* when they're running Union Cold Finished Steel Bars. Spindles whirl . . . tools bite into stock . . . and finished parts thump steadily into pans. That's MACHINABILITY—the Union Drawn kind.

Research has made Union Drawn Steel "MACHINABILITY Headquarters." Research that includes many years of actual production-line experience in steel users' plants . . . plus the unequalled facilities of famous Union Drawn machining laboratory.

That's why today's Union Cold Finished Steels consistently produce top ratings on feeds and speeds . . . freedom from abrasive elements . . . long tool life . . . smooth, bright machined surfaces...high production rates...low unit parts costs.

How about your production? Perhaps a session with one of Union Drawn's field technicians could help on set-up, tooling or other phases of machining steel . . . or, on cyaniding, carburizing, carbon correction and other forms of surface treatment. Just contact your Republic District Sales Office, your Union Drawn Distributor, or write:

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Union Drawn Steel Division • Massillon, Ohio
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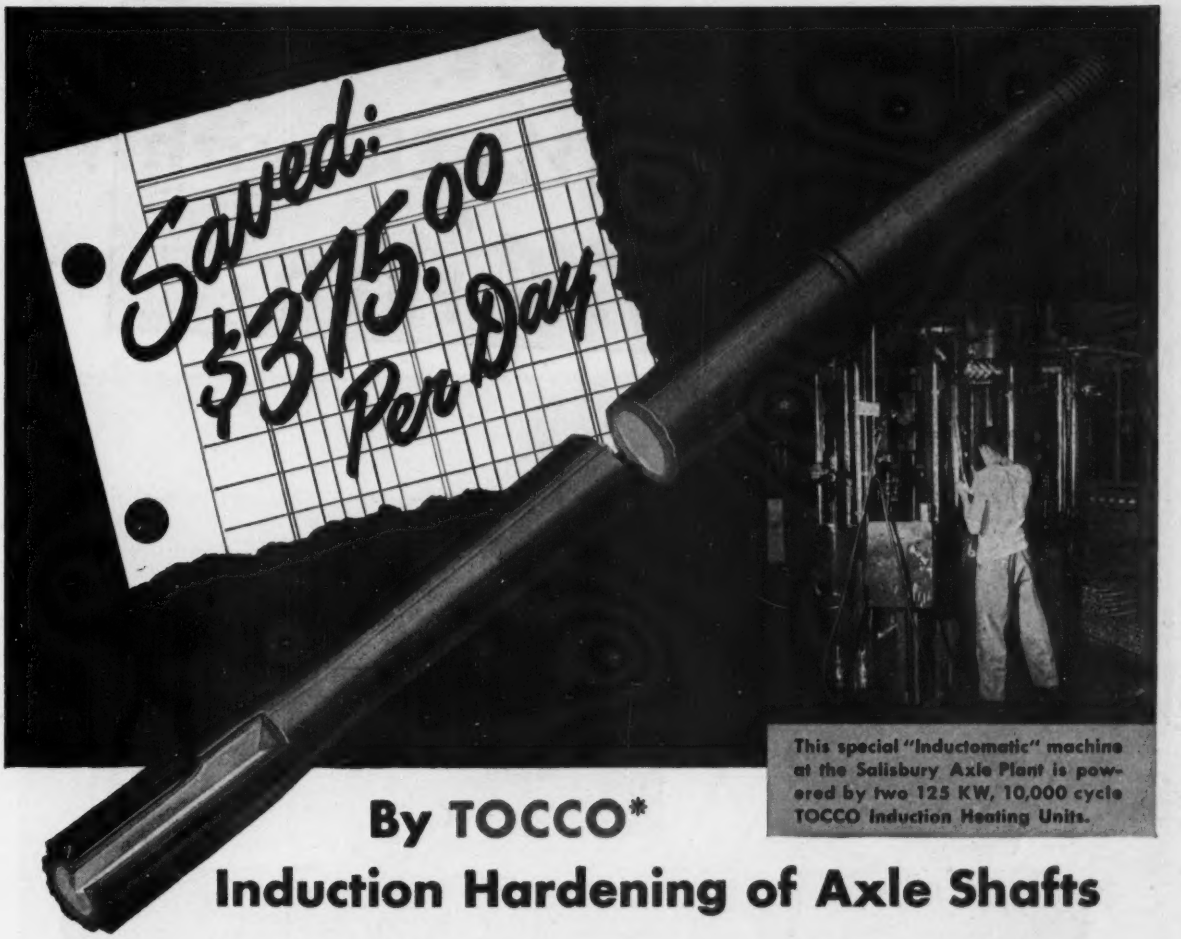
NEED STILL MORE SPEED?

Union Drawn's newest fast-machining grade, B-1113X, could be your solution. Where your equipment and parts design are such that faster speeds and heavier feeds are practical, "X" steel may help boost production still higher. Ask your Union Drawn field man when he calls. Or, write for free booklet 554, "Republic Union Drawn 'X' Steels." It's one of the six handy information-packed booklets in the Union Drawn "Pocket Library."

Republic UNION® COLD DRAWN STEELS

REPUBLIC STEEL

US



This special "Inductomatic" machine at the Salisbury Axle Plant is powered by two 125 KW, 10,000 cycle TOCCO Induction Heating Units.

By TOCCO* Induction Hardening of Axle Shafts

WHAT progressive engineers at the Salisbury Axle Division of Dana Corporation have done with Induction Heating for hardening automotive axle shafts suggests comparable savings for your products. Note this report:

SAVINGS of $375.00 per day caused by increased output and switch from SAE 4140 to SAE 1033 steel made possible by induction hardening.

LESS MACHINING time because shaft of SAE 1033 steel is completely machined prior to hardening. Tool cost cut in half—turning time reduced from 2 minutes to 30 seconds.

PRODUCTION DOUBLED. Formerly 50 axle shafts per hour with conventional combustion type heating—now 120 per hour with TOCCO.

PRODUCT IMPROVED. Torsional fatigue has increased 200%. The shaft is no longer a compromise between durability and machinability. It is hardened to 55 RC and drawn back to 43-47 RC. Degree of hardness and depth is accurately controlled.

TOCCO Engineers will gladly survey *your* operations for similar cost-cutting results in hardening, heat-treating or brazing—without obligation.

THE OHIO CRANKSHAFT COMPANY



TOCCO

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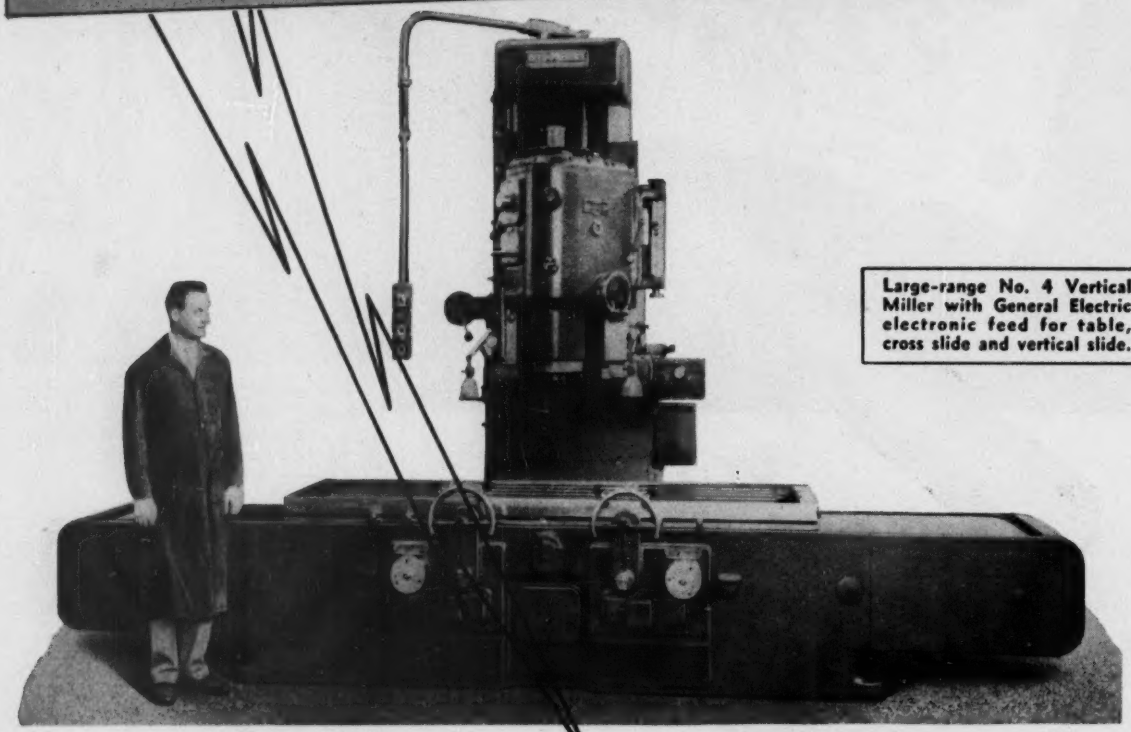
FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-12, Cleveland 1, Ohio

Please send copy of new bulletin. *"Principles of TOCCO Induction Hardening and Heat Treating".*

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LARGE RANGE VERTICAL MILLER with "ELECTRONIC" FEED



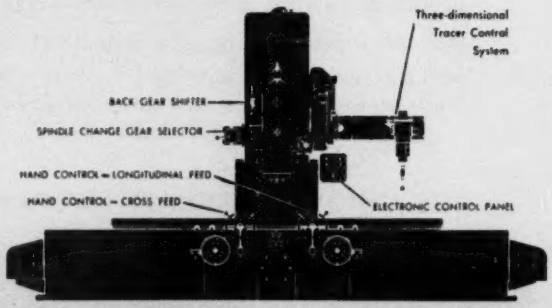
Large-range No. 4 Vertical Miller with General Electric electronic feed for table, cross slide and vertical slide.

Send for new No. 4 Miller catalog

REED-PRENTICE No. 4. Vertical Miller

SPECIFICATIONS: Machine Size	#4-60"	#4-96"
Longitudinal travel of table	60"	96"
Travel of cross slide	24"	24"
Table working surface	24 x 96"	24 x 132"
Feed range	½ to 25" per minute	
Spindle speeds 20 H.P. motor	45-1800 RPM	45-1800 RPM
30 H.P. motor	90-1800 RPM	90-1800 RPM
Spindle drive motor	20 or 30 H.P.	

One–, two–, and three-dimension General Electric contour follower systems available. Full details on request.



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GLEASON

PROUDLY ANNOUNCES



The No. 140 Rolling Quench Machine

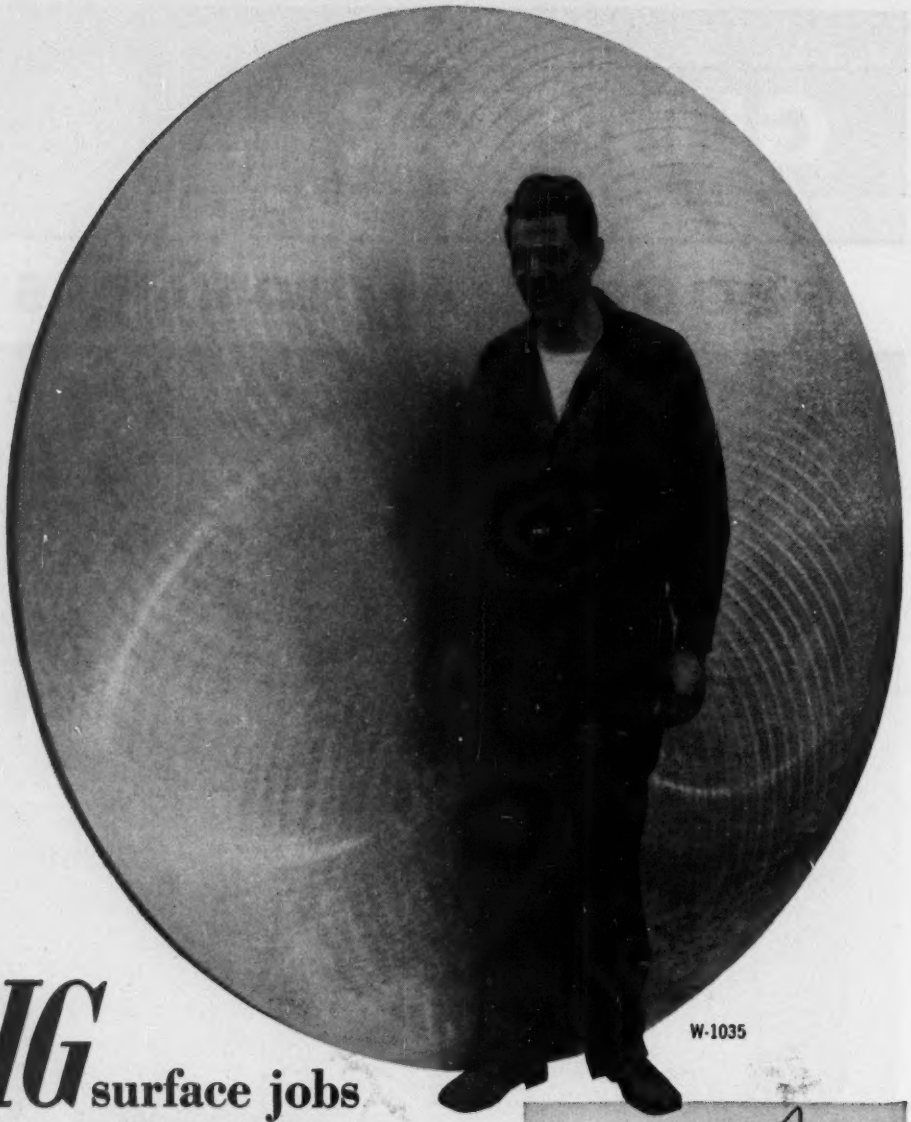
The No. 140 Rolling Quench Machine is an entirely new machine designed for holding and quenching heated shafted parts with a minimum of distortion. Handles shafts up to 40" long and 4" diameter. Ideal for job lots or high production.

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GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

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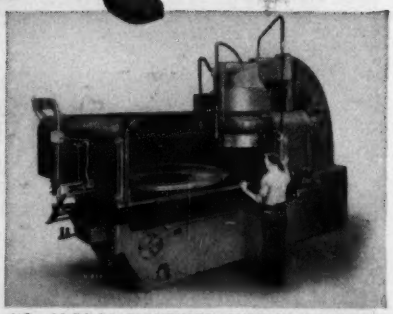


W-1035

Those *BIG* surface jobs are easy with a Blanchard!

No other machining method can match the speed, economy and quality of Blanchard Grinding on large flat surface work. This 88" diameter, cast iron plate, for example, was rough ground in 3½ hours, floor to floor. *¼" of stock was removed from one side —a total of 1520 cu. in.—380 pounds!*

After normalizing, finish grinding on the Blanchard produced a water-tight joint, with a Blanchard ground mating service, each being flat within .001". Why try to machine your large work with time-consuming methods, when Blanchard Grinding offers such speed, economy and quality with surprisingly low wheel costs?



NO. 42-72-84 BLANCHARD SURFACE GRINDERS

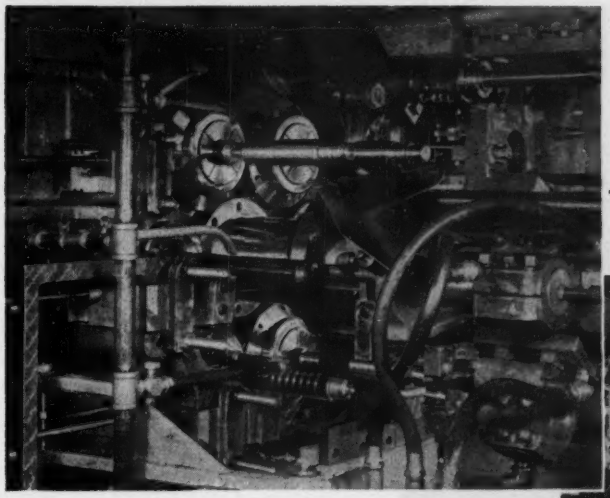


Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

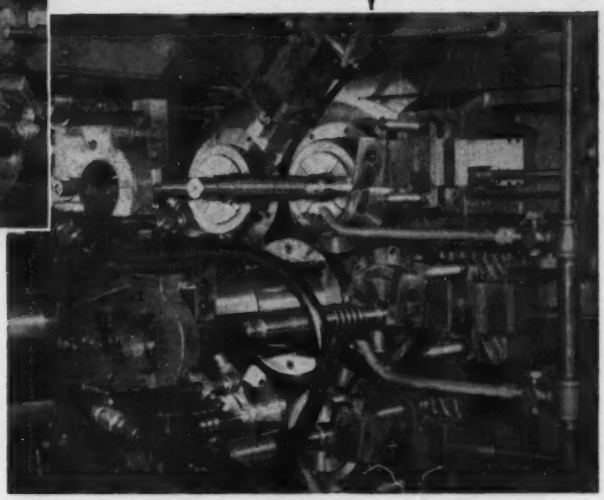
PUT IT ON THE BLANCHARD

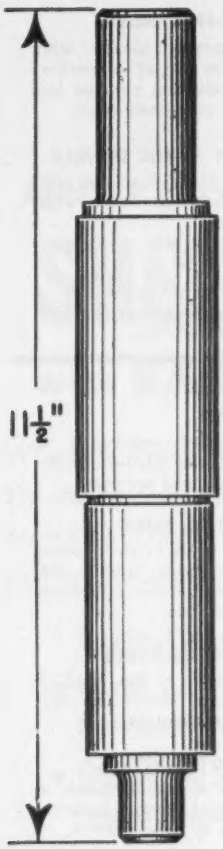
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



Tooling Area 3½-SIX
Front Side Rear Side





Automotive Transmission Shaft

A very good reason why CONOMATICS handle a wider variety of machining operations per single chucking is their greater number of tooling positions.

WITH MORE TO SELL THERE'S MORE TO TELL

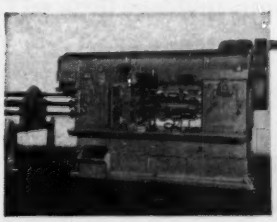
Whether you're selecting a new golf club, motor car, or multiple spindle bar automatic, you want what best fits into the "scheme of things."

Before you can be sure that any product will meet your requirements you must have information. And you can judge only by that at hand or available. Complete information lets *you* decide what's important to *you*. That's as it should be.

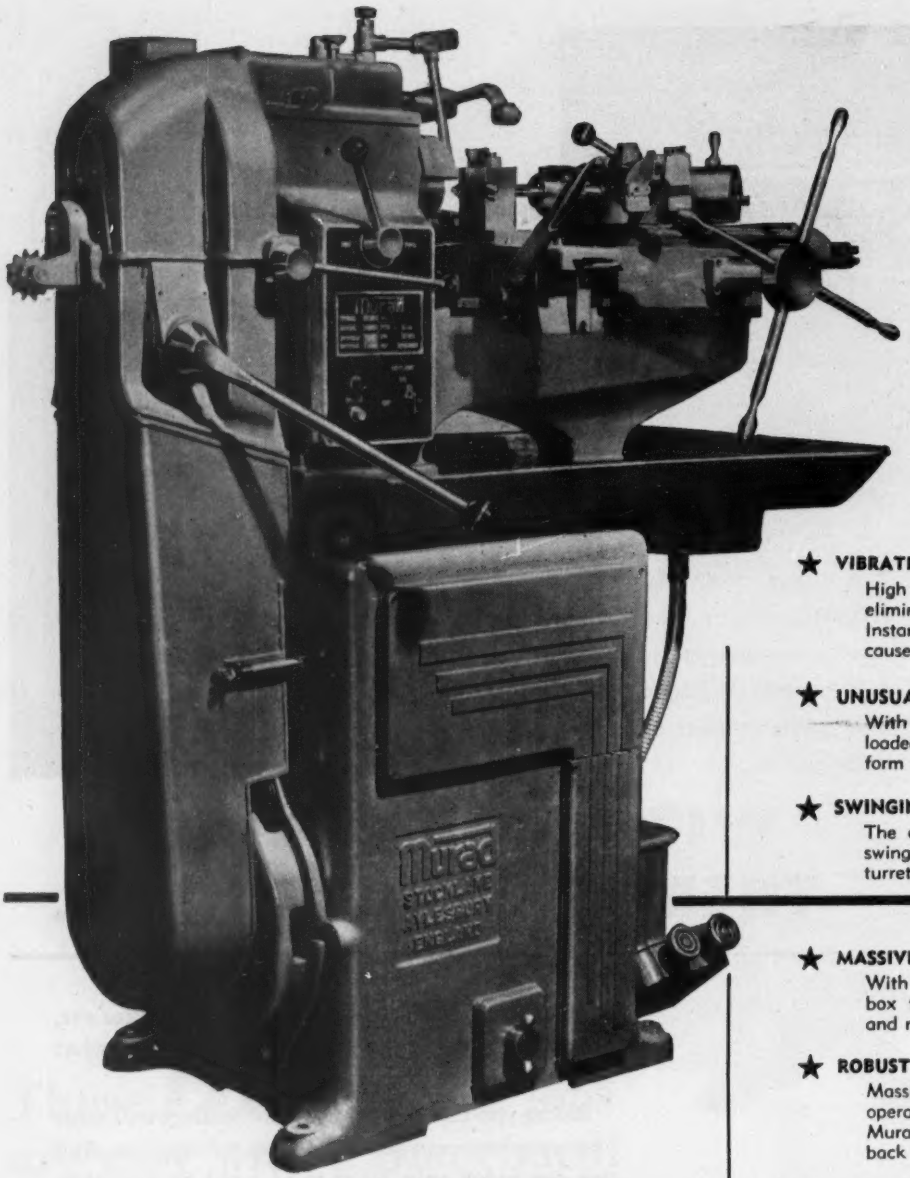
There's always more information to be had about the product that has more to offer. It's that way about CONOMATICS. And you can always have *complete* information. If you will write, wire, or phone, you can have it now.



A Comparison of ALL Automatics is in favor of Cone



Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Murad

ram type turret lathe

Designed and built for increased and improved production, the MURAD ram type turret lathe has a proven record which more than justifies all the claims put forward on its behalf. Special features of design make it unexcelled anywhere for production capacity, accuracy and operative convenience.

★ **VIBRATION-FREE DRIVE**
High spindle speeds with elimination of all vibration. Instant reversing possible because of cushioned drive.

★ **UNUSUALLY LARGE SPINDLE**
With its Hyper-Precision preloaded bearings allow wide form cuts.

★ **SWINGING STOP**
The only turret lathe with a swinging stop giving an extra turret tool position.

★ **MASSIVE BED**
With special positioning of box type ribs giving rigidity and maintained accuracy.

★ **ROBUST CROSS SLIDE**
Massive adjustable screw operated cross slide with Murad micrometer adjustable back tool slide.

★ **CONVENIENT CONTROLS**
Come easily to the hand at the natural height for fast and easy operation.

★ **SPEEDY FOOT CONTROL**
A choice of spindle speeds in the ratio of 1 to 4 instantly available by pedal control.

MURAD DEVELOPMENTS LIMITED, AYLESBURY, BUCKS, ENGLAND



Here's How You Can Benefit From

SHELL MOLDING

with BAKELITE *Phenolic Resins*

When you design metal parts, ferrous and non-ferrous, with the shell molding process in mind, you can count on several economic benefits to be obtained from this modern foundry casting technique:

- **Castings have almost pattern-smooth surfaces.**
- **Pieces are cast to closer finished dimensions—tolerances as close as .003 to .005 inches per inch.**
- **Higher percentage of sound, uniform castings means fewer rejects.**
- **Better detail minimizes machining operations.**

The shell molding process utilizes thin, lightweight shell molds of fine-grained sands bonded with BAKELITE Phenolic Resins. Your foundrymen can tell you how to benefit from this process. Or, we'll gladly send you information about the BAKELITE Phenolic Resins developed expressly for shell molding, if you'll write Dept. EF-19.



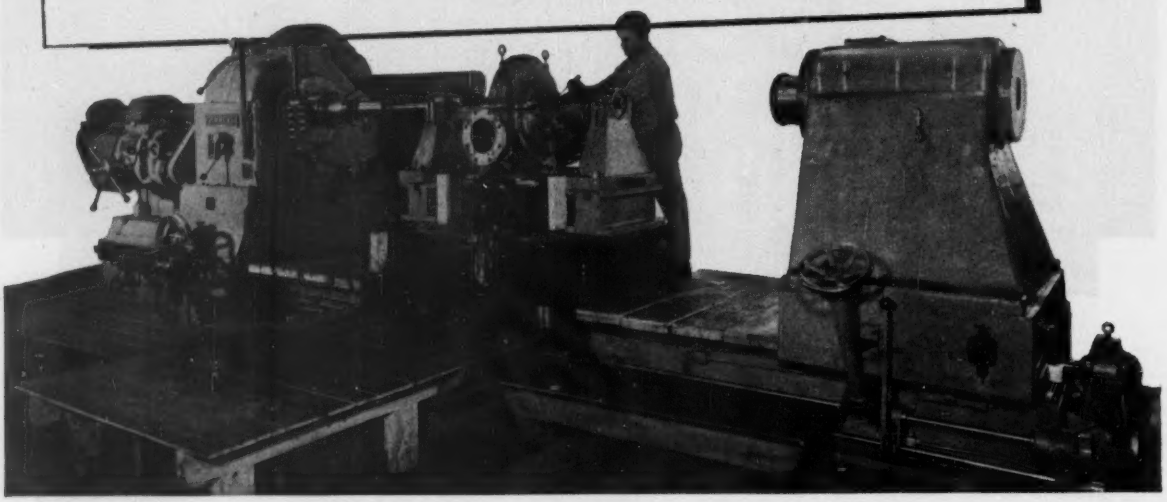
Casting by Walworth Co., New York 17, N. Y.

BAKELITE
TRADE-MARK
PHENOLIC RESINS
FOR SHELL MOLDING

TRADE MARK

BAKELITE COMPANY
A Division of Union Carbide & Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
UCC
In Canada:
Bakelite Company (Canada) Ltd., Belleville Ont.

Machining Time on Pump Casings Cut 45% at De Laval Steam Turbine Co.



FOR DEEP BORING:

The Simmons 6" Boring and Facing Machine

When installed in De Laval's boring department, the Simmons 6-in. Bar Horizontal Boring and Facing Machine proved itself in no time.

In boring and facing single-stage pump casings, it cut previous average machining time by 45%. And in machining worm gear cases, machining time was cut by 50%.

"The Simmons machine has all the horsepower we need," says De Laval's foreman of the boring department. "In fact, it has the horsepower, the speeds and feeds we need for carbide tooling. And that's why we've been able to boost our output so substantially."

* * * *

There's really no such thing as *the* Simmons 6-in. Boring and Facing Machine. It's actually many machines—all based on the same unit-type construction, but each adapted to the special needs of different manufacturers. It can be adapted to your needs, too, no matter what your deep-boring job. Write for details.

Check these features

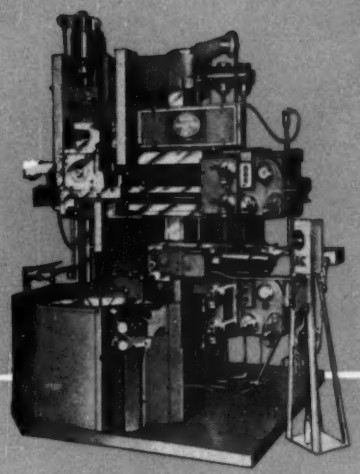
1. Automatic, continuous facing head permits high-speed facing with carbide tools.
2. Hydraulic feed to entire head in addition to normal bar feed.
3. Boring head fed to and from work reduces overhang of boring bar to a minimum—resulting in greater accuracy.
4. A range of bar speeds between 3 and 200 rpm and bar feeds from 0.0005 in. to 0.500 in. per revolution can be supplied.
5. Up to 50 HP motor drive.
6. Precision anti-friction bearings used throughout.
7. Standard bar length is 17 ft.; travel in one setting is 72 in. Bed lengths and widths supplied to your needs.
8. Unit-type construction enables basic boring and facing unit to be adapted to your special requirements.

SIMMONS MACHINE TOOL CORPORATION

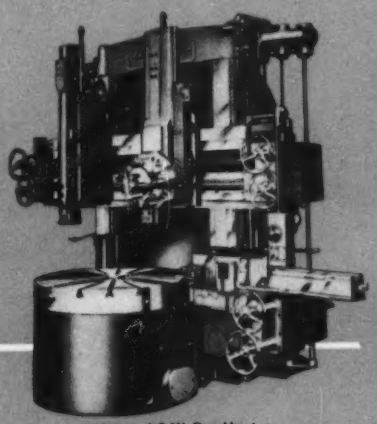
1600 North Broadway, Albany 1, New York

BULLARD MACHINE TOOLS

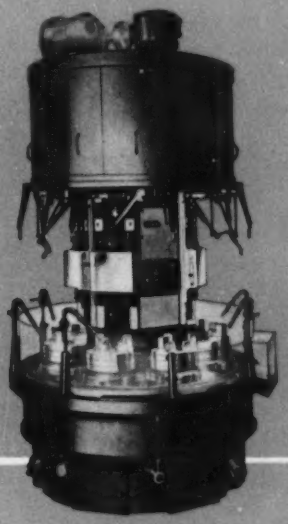
FOR GREATER MANUFACTURING ECONOMY



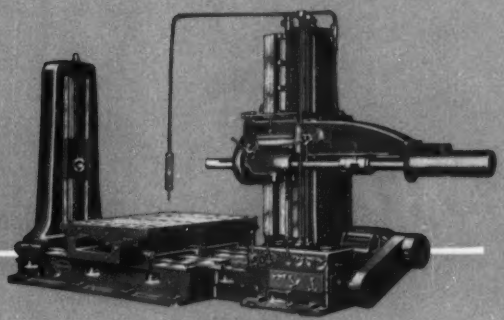
Man-Au-Trol Vertical Turret Lathe
30" — 36" — 42" — 54" — 64" and 74" sizes



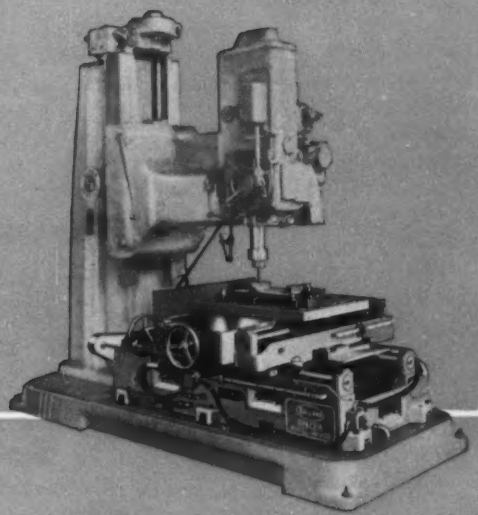
30" and 36" Cut Master
Vertical Turret Lathe with two heads
42" — 54" — 64" and 74" available
with several combinations of heads



Mult-Au-Matic Type "D"
with a wide range of sizes
and numbers of spindles



4" and 5" Spindle
Bullard Horizontal Boring, Milling and
Drilling Machines with 4-Way bed



30 x 20 Spacing Table mounted on Super
Service Drilling Machines. It may also be
mounted on 4' — 5' or 6' Radial Drills

Bullard's variety of machine types covers a wide range of requirements For the diversified industries

Industry Selects BULLARD Equipment for Its MANUFACTURING EFFICIENCY

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



TO THE WORLD IN

and to you in pe

Merry Chr

AND A HAPPY

At this season it behooves all of us to lo
many accomplishments which have come about in
the situation as to betterment of productive capacities
done can usually be improved upon and wi
equipment and modern manufacturing methods wit
Consider then the advantages which Bullard e
may afford you in your plant operation during the ye

THE BULLAR
BRIDGEPORT 2,



MANUFACTURERS OF MULT-AU-MATICS. CUT MASTER
AND MAN-AU-TROL VERTICAL TURRET LATHES. SPACING TABLES.
AND HORIZONTAL BORING. MILLING AND DRILLING MACHINES.

PAC

MISS

JONES & LAMSON
UNIVERSAL BENCH TYPE
NING MACHINE

sers, this *Low Cost*, space saving
pensive machine tools for their
do a better job of chaser sharp-
all tool and cutter grinding too.

ersal Application Equipped
h the new J & L chaser grind-
fixture and adapters, an out-
nding job will be done on all
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gent and radial die chasers.
lapters for J & L chasers avail-
le from stock. Adapters for
her chasers can easily be applied
the chaser grinding fixture.

etitive Accuracy This ma-
ine will duplicate desired
inds repeatedly. It is a precision
achine tool equipped with all
cessary stops and controls.

y to Operate Simple, direct
ethods speed up the operation
d cut costs. Even an inexperi-
nced operator can, in a few
minutes, learn to resharpen
chasers on this machine.



Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Cost This complete unit, de-
igned to do your entire chaser
esharpening job, sells for only a
mall fraction of the cost of other
ulkier machines often used.
Vhy not install one in your plant,
nd release your heavier, bulkier
achines for their intended uses?

e this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710

DIE HEAD DIVISION



TO THE WORLD IN GENERAL

and to you in particular . . .

Merry Christmas

AND A HAPPY NEW YEAR

At this season it behooves all of us to look back over the past year to the many accomplishments which have come about in our organizations and review the situation as to betterment of productive capacities for the coming year. A job well done can usually be improved upon and with the new year, it is well to consider equipment and modern manufacturing methods with their attendant savings in cost.

Consider then the advantages which Bullard equipment listed on the following page may afford you in your plant operation during the year 1953 and many years to follow.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

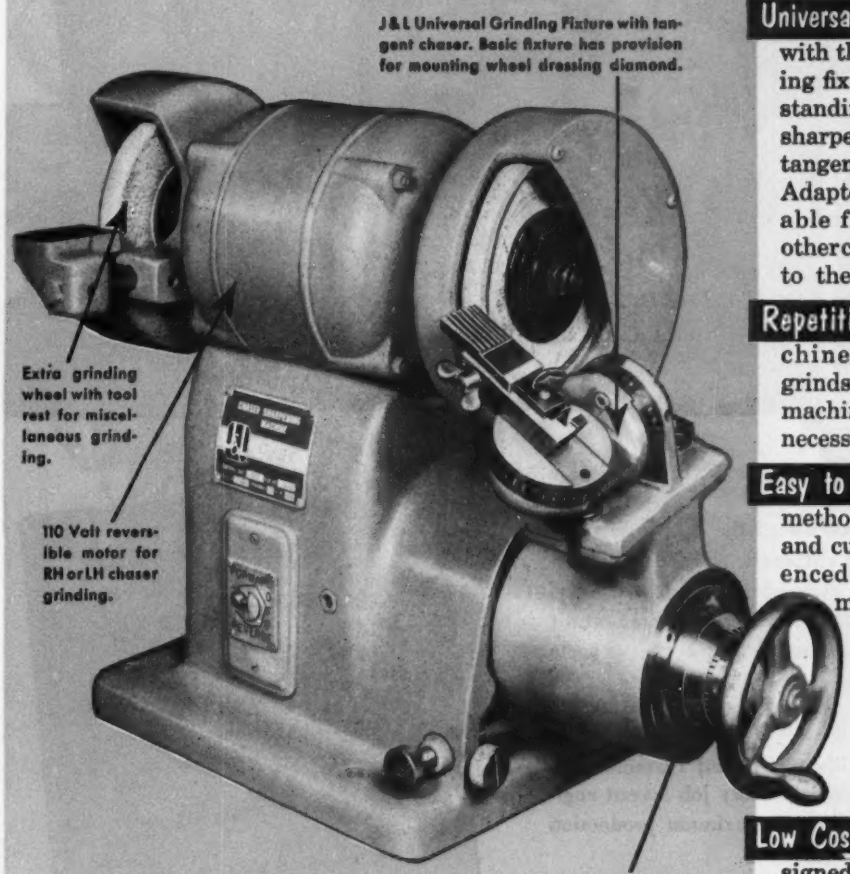


MANUFACTURERS OF MULT-AU-MATICS. CUT MASTER AND MAN-AU-TROL VERTICAL TURRET LATHES. SPACING TABLES. AND HORIZONTAL BORING. MILLING AND DRILLING MACHINES.

NEW

JONES & LAMSON UNIVERSAL BENCH TYPE CHASER SHARPENING MACHINE

Specifically designed to resharpen chasers, this *Low Cost*, space saving machine allows you to free heavy expensive machine tools for their intended uses, and at the same time do a better job of chaser sharpening. *It's good for miscellaneous small tool and cutter grinding too.*



Grinder set up to resharpen J & L Tangent chasers

Universal Application Equipped with the new J & L chaser grinding fixture and adapters, an outstanding job will be done on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers available from stock. Adapters for other chasers can easily be applied to the chaser grinding fixture.

Repetitive Accuracy This machine will duplicate desired grinds repeatedly. It is a precision machine tool equipped with all necessary stops and controls.

Easy to Operate Simple, direct methods speed up the operation and cut costs. Even an inexperienced operator can, in a few minutes, learn to resharpen chasers on this machine.

Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Low Cost This complete unit, designed to do your entire chaser resharpening job, sells for only a small fraction of the cost of other bulkier machines often used. Why not install one in your plant, and release your heavier, bulkier machines for their intended uses?

Because of its size this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.

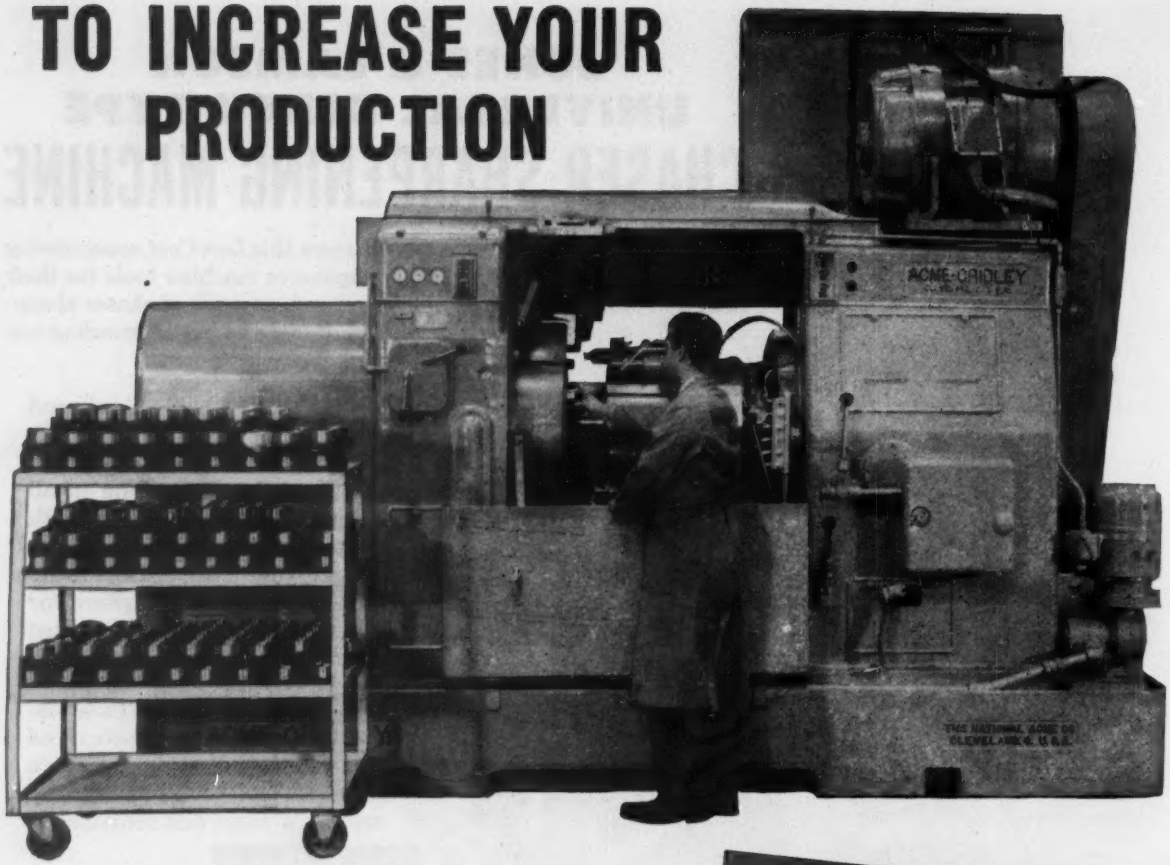
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710

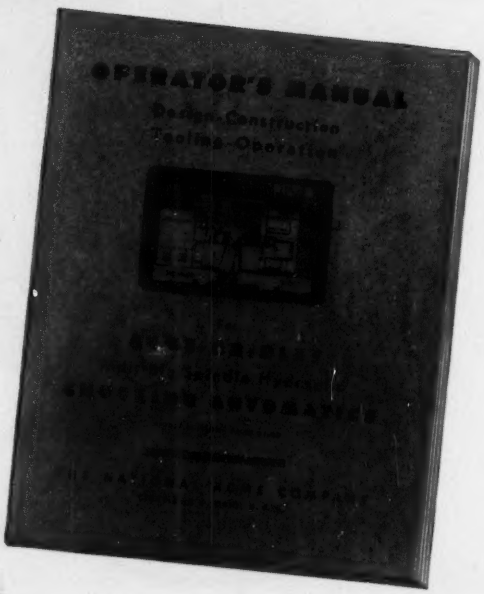
DIE HEAD DIVISION

TO INCREASE YOUR PRODUCTION



GET THE ADVANTAGES of the latest developments in multiple-spindle automatic chucker operation—get Acme-Gridley fully hydraulic chucking machines, the choice of a constantly growing list of important manufacturers who are stepping up their output of parts for shells, guns, tanks and planes.

GET OUR NEW 44-PAGE OPERATOR'S MANUAL, generously illustrated and crammed full of practical information to help every job layout engineer, foreman and operator get maximum production out of his Acme-Gridley Automatic.



HOW TO GET YOUR FREE COPY

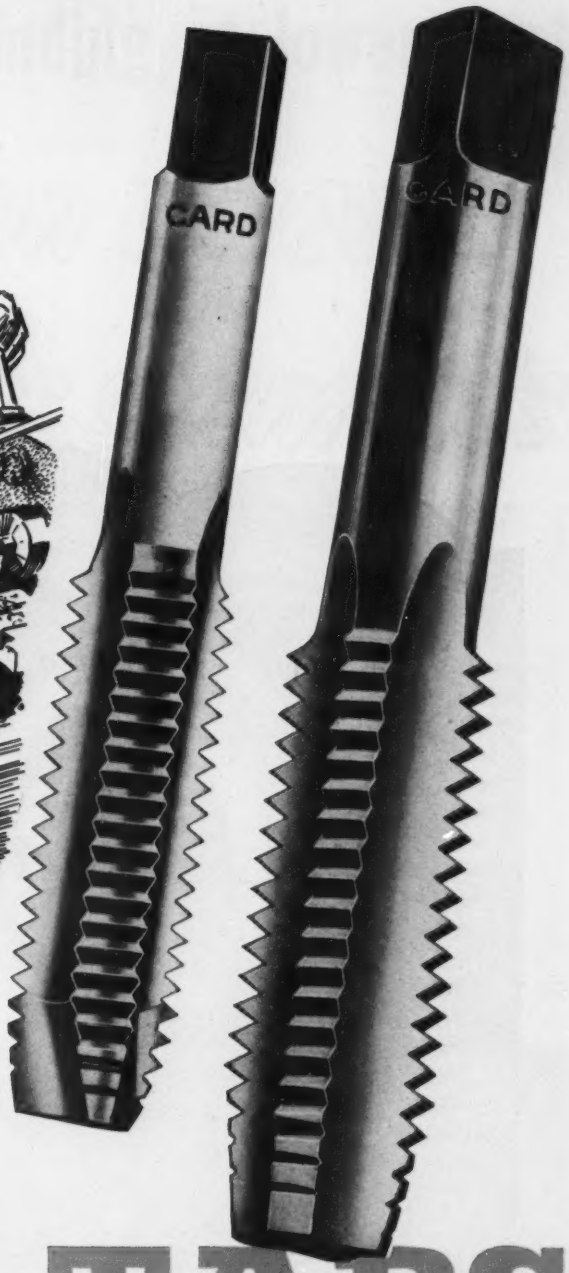
Write to us on your company letterhead, giving your name and address and the size of RPA or RAC Acme-Gridley (or serial number of machine) on which you work.

The NATIONAL ACME CO.

170 EAST 131st STREET · CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing





YOU'RE SURE

OF TRUE "SPECS"

WHEN YOU ORDER

CARD TAPS

All Card taps are given many rigid factory-inspections. They are manufactured in carbon steel and in high-speed steel—cut thread, commercial ground or precision ground. S. W. Card Manufacturing Company, Mansfield, Mass. Division of Union Twist Drill Co.

ASK YOUR CARD DISTRIBUTOR FOR COMPLETE DETAILS

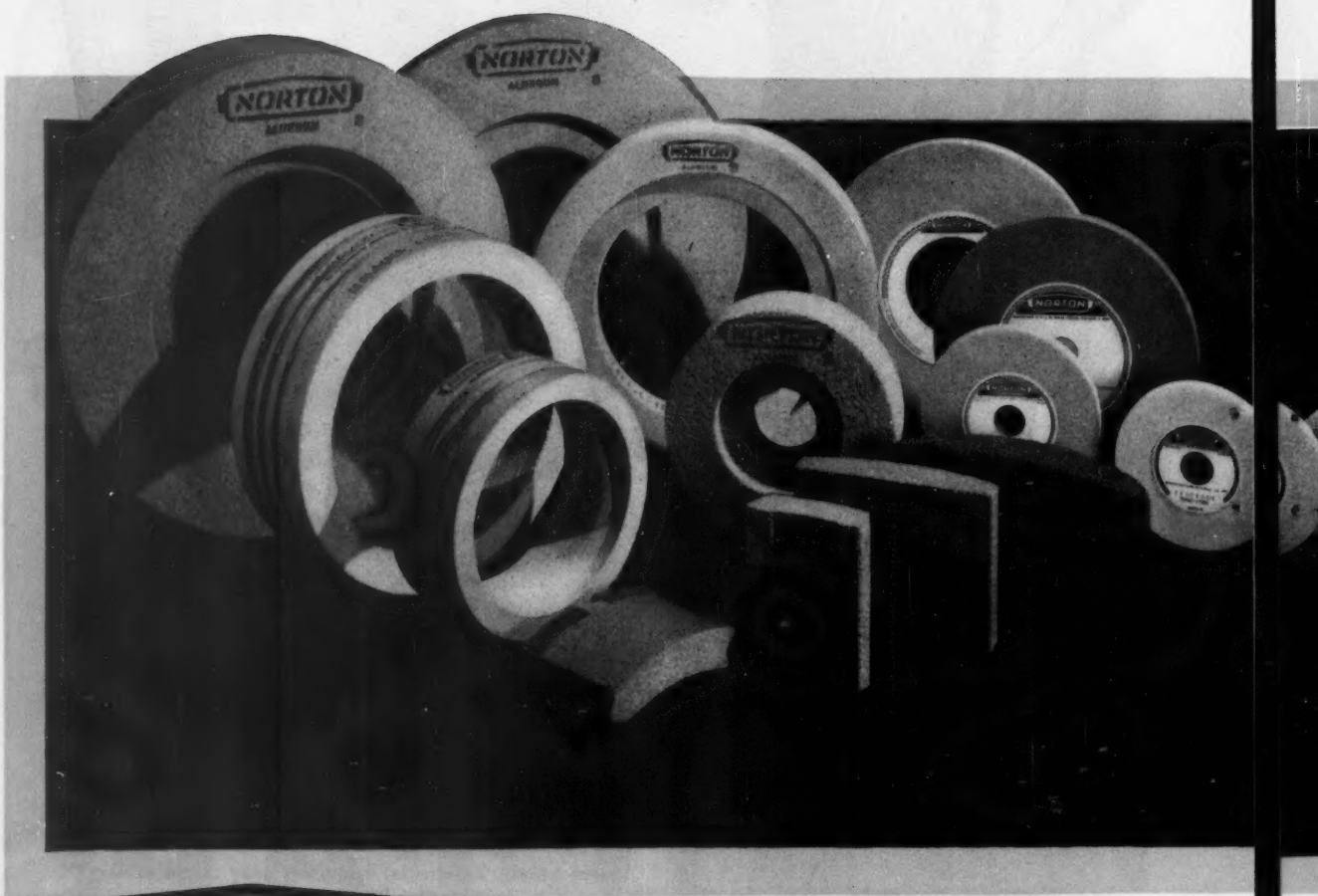
The CARD Quality

TAPS

Also makers of DIES • SCREW PLATES • DIE STOCKS
TAP WRENCHES

For more

you have a wide



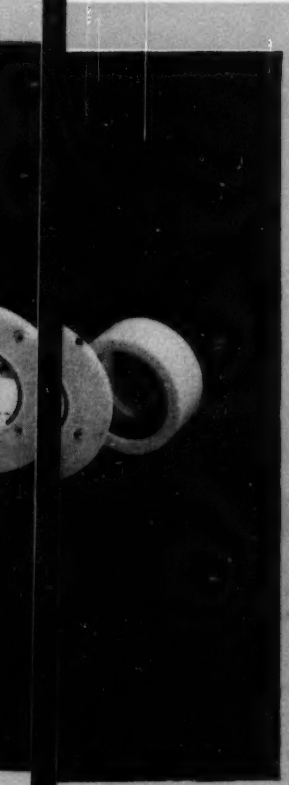
NORTON

ABRASIVES

Making better products to make other products better

efficient surface grinding at lower cost

choice of *Norton wheels, cylinders, segments*

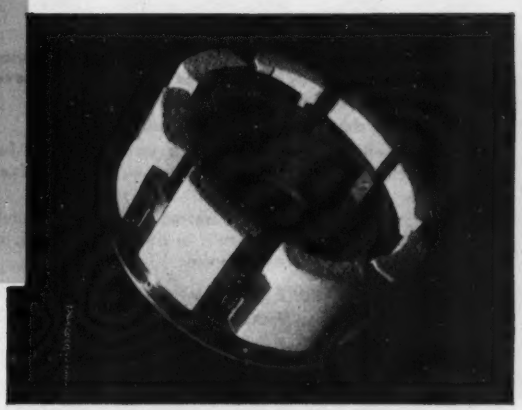


Choose Norton ALUNDUM* abrasives for surface grinding high-speed steels, #400 series stainless steels, carbon steels, alloy steels, annealed malleable iron and the tough bronzes. There are five types of ALUNDUM abrasives available — 19 ALUNDUM, the revolutionary 32 ALUNDUM, 38 ALUNDUM, 57 ALUNDUM and Regular ALUNDUM. First choice in solid wheels or segments, particularly where rapid stock removal is an important factor, is 32 ALUNDUM abrasive which has the unique property of a nubbly grain shape and exceptional point endurance.

Choose Norton CRYSTOLON* abrasives for surface grinding hard cast iron, chilled iron, #300 series stainless steel, brass, soft bronzes, aluminum, rubber, and hard facing alloys. The first choice for grinding all of these materials is hard, sharp 37 CRYSTOLON abrasive.

Norton Bonds for surface grinding include vitrified, silicate and resinoid. For use with the ALUNDUM abrasives, Norton Research has developed a special vitrified bond known as "BE".

NORTON COMPANY, Worcester 6, Mass. Warehouses in 5 cities. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.



Step up your production with this Norton chuck and segments

Use on vertical spindle surface grinders where contact is broad. Replace the cylinder wheel with a Norton chuck and segments. Can be mounted without machine alterations. Segments can be changed or adjusted without removing chuck. Gives faster cutting action — lower rate of wear.



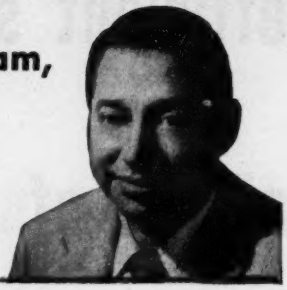
See Your Norton Distributor

For the *right* abrasive, the *right* bond, the *right* structure for your surface grinding jobs, see your Norton Distributor. He will be glad to show you how to get the best results in grinding, consulting directly with a Norton Abrasive Engineer should additional advice be necessary. Ask him, too, for your copy of the brand new Booklet 1632, "The ABC of Surface Grinding" — or write us direct. Contains 88 fact-filled pages of helpful information.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

"Since using your simplified lubrication program, we have enjoyed substantial savings" . . .

says SAM PLANER, President,
Piedmont Mills, Inc., Gastonia, North Carolina



You, too, can simplify and save—with

BE SURE PURE WITH PURE

PURE OIL INDUSTRIAL LUBRICANTS



Pure Oil's complete line of top-quality industrial lubricants includes many oils and greases designed to do several *different* jobs, instead of one specific job.

And to do each job *equally* well.

This enables you to reduce your lubricant inventory . . . simplify your lubricating procedures . . . minimize waste and error.

If you are interested in something that definitely can save you money (and who isn't, in times like these), contact your local Pure Oil office* or write:

THE PURE OIL COMPANY, Industrial Sales
35 East Wacker Drive, Chicago 1, Illinois

Take a tip from Piedmont

They needed to use 3 different lubricants for their air compressors and electric motors. Now, PUROPALE HEAVY oil does all 3 jobs! Does them better, Mr. Planer says, and *for less!* Whatever type of machinery you have in your plant, your Pure Oil representative can help you, too, find ways to *simplify* and *save* with Pure Oil industrial lubricants.

Be sure with Pure

*Sales or affiliate sales offices are located in Atlanta, Georgia • Birmingham, Alabama • Charlotte, North Carolina • Chattanooga, Tennessee • Columbus, Ohio • Hattiesburg, Mississippi • Indianapolis, Indiana • Jacksonville, Florida • Madison, Wisconsin • Memphis, Tennessee • Miami, Florida • Minneapolis, Minnesota • New York, New York • Norfolk, Virginia • Parkersburg, West Virginia • Pensacola, Florida • Seaford, Delaware.

ANOTHER GIANT CONSOLIDATED SPECIAL MACHINE FOR UNUSUALLY LARGE WORK



SELLERS COMBINATION PLANER-MILLING MACHINE PLANING A HUGH CASING

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

The Sellers Combination Planer-Milling Machine is used in the production of equipment for industrial and power generating applications such as, synchronous condensors, hydraulic turbine-driven generators and large motors and generators for steel mills and similar installations. Two machines in one . . . a planer and a miller . . . it eliminates the necessity of transfering work from one machine to another when both planing and milling operations are required. This huge machine is over 76 feet long, 27 feet high and weighs more than 645,000 pounds. It has the capacity to machine work 14 feet wide, 16 feet high and 30 feet long. Due to the enormous capacity of the machine, several parts to be machined may be bolted together and handled as a single unit.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK



One for every place— one place to get them all

PROBLEM—In every industry, designers and production engineers are constantly confronted with the problem of combating friction. Every turning part of machinery presents problems of speeds and loads—sometimes radial, sometimes thrust loads—usually both.

SOLUTION—Depend on SKF ball and roller bearings and pillow blocks to combat wasteful friction. SKF engineers can help you put the right bearing in the right place.

RESULT—Your equipment will improve in performance. SKF's wide range of bearing types and sizes, plus engineering know-how, makes it possible to select that type with those characteristics which make it the best choice for your particular application.

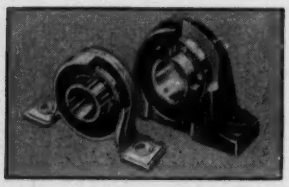
Write, **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7343

SKF®
BEARINGS AND PILLOW BLOCKS

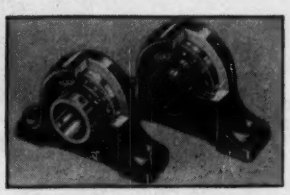
—or contact your authorized SKF Distributor to help you put the right bearing in the right place.



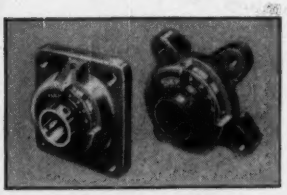
SERIES SAF—Ball or roller bearing pillow blocks, with Triple-Seal rings which keep dirt out, lubricant in. Wide range of load-carrying capacities.



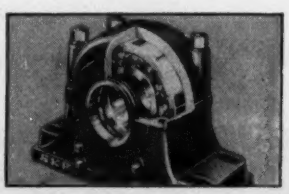
SERIES SES and SY—Unit ball bearing pillow blocks. The SES is mounted in rubber, prevents transmission of noise. The SY permits liberal misalignment—is effectively sealed by famous SKF Red Seal.



SERIES SUS and SUA—Unit ball bearing pillow blocks (SUAR equipped with spherical roller bearings). Ring seals exclude dirt. The SUA is an adapter-type mounting.



SERIES FUS and FUA—Ball bearing flanged unit having same features as SUS and SUA pillow blocks. (FUAR equipped with spherical roller bearings).



SERIES SDAF—Exceptionally sturdy construction for unusual shock and heavy thrust loads. Equipped with Triple-Seal rings for bearing protection.

What makes the SNORKEL PEN "breathe"?



Sheaffer's new Snorkel Pen created a sensation when it was introduced to the trade. Using air alone, the pen is emptied, cleaned and refilled through the filling tube of the Snorkel Pen with a one-stroke touch-down action.

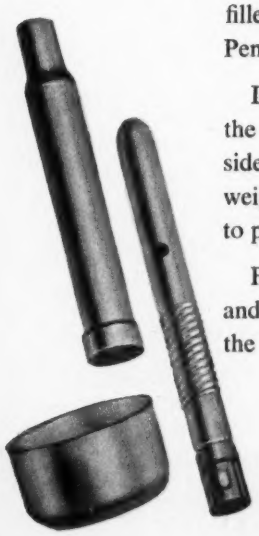
Designing the two brass "lungs" comprising the plunger-siphon mechanism called for considerable ingenuity. They must be light in weight, stiff and strong, easy to form and easy to polish and plate.

Formbrite* met all of these requirements—and more. With a metal thickness of only .0058", the 2" long cylinders are formed in multi-plunger presses in eight successive operations—*without annealing of any kind.*

Formbrite's superfine grain resulted in a harder, stronger, longer-lasting product with savings up to 50% in polishing costs.

Surprisingly, Formbrite, with all the plus values it offers over conventional drawing brasses, costs no more. See the reverse page for another application of Formbrite. And write for Publication B-39, addressing The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario, Canada.

*Reg. U.S. Pat. Off. 5298



Cups like this, blanked and formed in one operation from Formbrite strip 1 13/16" x .0058", are magazine-fed into multi-plunger presses. Eight successive operations produce the sleeves illustrated at top of page *without annealing*. Sleeves at left are finished, ready for chromium plating.

Formbrite
is an
ANACONDA PRODUCT
Made by The American Brass Company



You can do this *better cheaper faster* IF THE METAL IS Formbrite

Since The American Brass Company introduced Formbrite* as a superior drawing brass, scores of stamping shops, polishing and plating rooms throughout the country have changed their thinking.

Comparative tests prove conclusively that the superfine grain structure of this specially processed forming brass means stamped and formed products that are stronger, harder, "springier" and more scratch-resistant. Yet the metal is so ductile that it can be readily formed, drawn and embossed.

Timestudies made of finishing operations have shown that a bright, lustrous finish can be obtained by a simple "color buffing" operation in half the time previously required.

That's why we say you can do it *better, cheaper and faster* with Formbrite. Millions of pounds of Formbrite sheet and strip have been produced and economically fabricated into hundreds of different products. Want a sample—and more information? Address The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario, Canada. 5295

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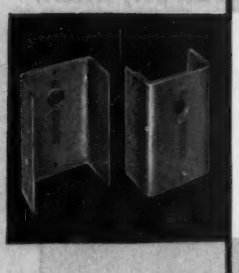
In the pressroom of a supplier, the back of a military brush is blanked from Formbrite red brass strip.



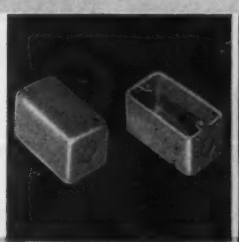
Empire Brushes, Inc., Port Chester, N. Y. produces an extensive line of military and clothing brushes with Formbrite components. At right, a decorative band is being applied.

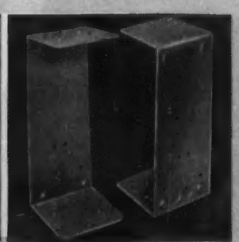
Formbrite
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ACCURATE





Perhaps you don't think of accuracy as an important factor in the production of stampings like those illustrated here— but maybe you should. Accuracy in press operation is more than a matter of holding tolerances in the work. Inaccurate operation means unnecessary wear on dies, and that costs money.

The fact that Clearing presses were chosen by this manufacturer of electrical equipment is significant because it demonstrates a real understanding of the elements of cost. If you consider all the factors, you will choose Clearings, too.

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CLEARING PRESSES

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at General Sheet Steel Co., Detroit, Mich.



NIAGARA

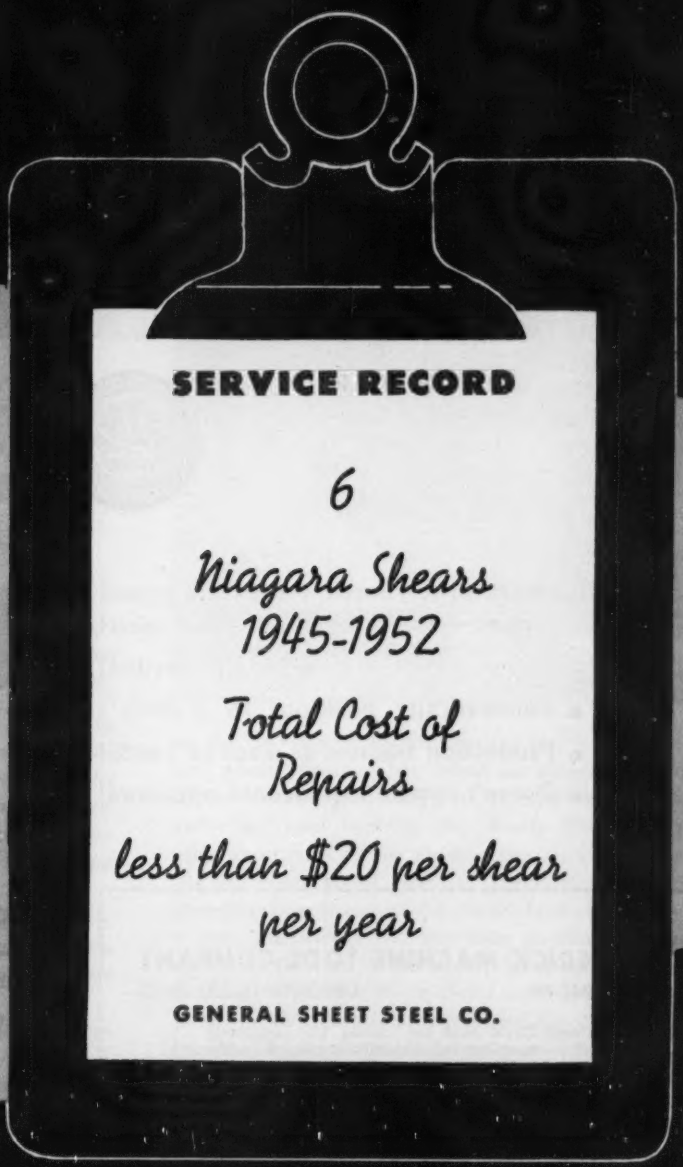
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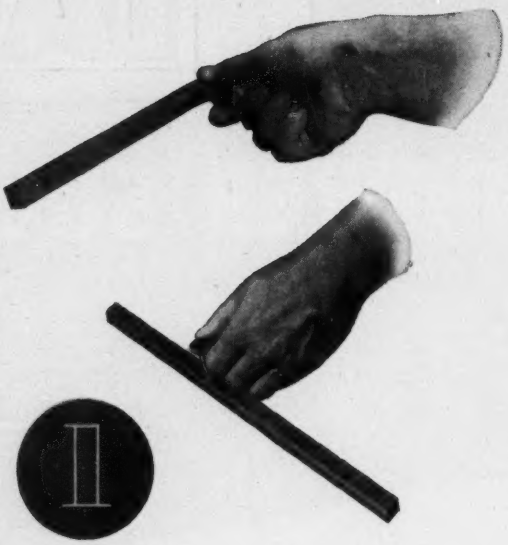
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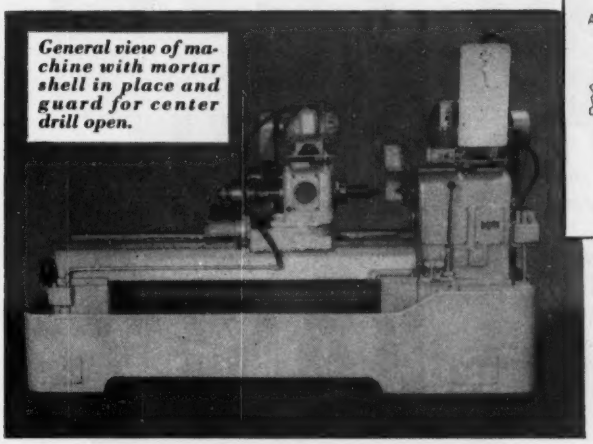
DEPT. M,
THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

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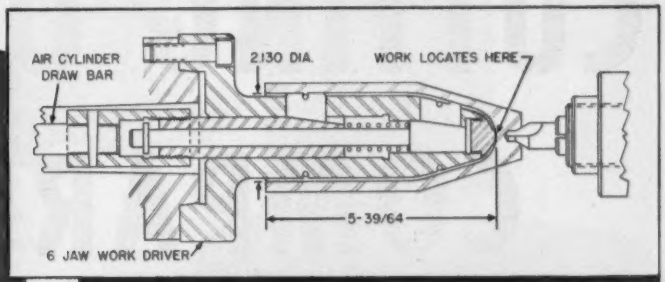
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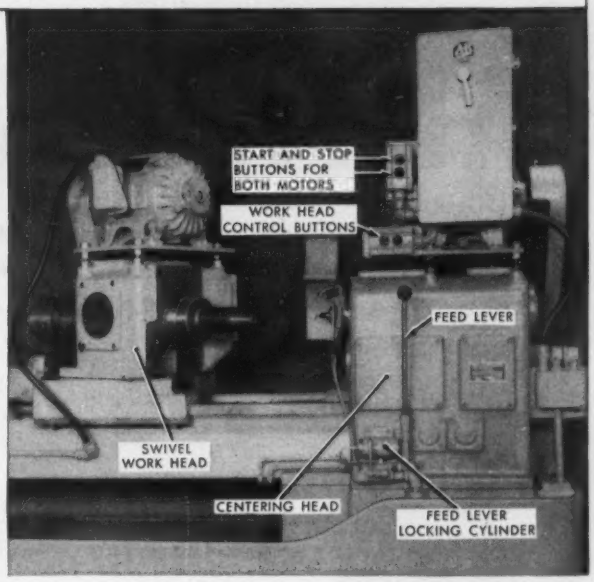
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



General view of machine with mortar shell in place and guard for center drill open.





MODEL "CS" *Lo-swing* CENTERING MACHINE MAINTAINS UNIFORM WALL THICKNESS IN PROJECTILE TURNING

Problem: **To center forged shells concentric with bore and to hold center depth in relation to bottom of cavity.**

Solution: **A standard Model CS Automatic Centering Machine equipped with a special revolving Swivel Head was selected for this job. This work head, shown swiveled to the loading position in the close-up illustration, provides ample clearance for loading and unloading shells from the long centering arbor which extends the full depth of the shell.**

The work head spindle revolves at slow speed while the center drill revolves at its own correct drilling speed. This combination provides the most accurate method of centering hollow parts.

The work is held and centered on a six-jaw, air-operated expanding driver, shown in the line drawing. The three jaws near the open end are positively operated by the air cylinder, while the three jaws located near the bottom of the bore are operated by heavy spring tension to compensate for any variation in the diameter of the rough bore.

The Model CS Automatic Centering Machine is entirely automatic... the operator merely places a shell on the driving arbor and pushes the Work Head control push button. This starts an automatic sequence of movements consisting of closing the chuck jaws, swiveling and locking the Work Head for proper alignment, and finally closing the air clutch for starting the Work Head Spindle. The completion of these movements releases a lock on the feed start lever which is now pushed by the operator to start the machine cycle. At the end of the cycle, the machine stops automatically with the Work Head swiveled to the loading position, the spindle stopped and the driving jaws released. The operator simply removes the finished part and replaces it with a rough part. The motors on both the Work Head and Centering Head revolve continuously, even during the loading part of the cycle.

The illustrations show the centering operation on an 81mm Howitzer shell but other types and sizes of shells may be centered simply by changing the work arbor.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

HOW DO YOUR CUTTING OIL COSTS COMPARE WITH ANTISEP ALL PURPOSE BASE?

Chances are you're paying much more than 8¢ per gallon in the machine... the average cost of Antisep All-Purpose Base. And Antisep All-Purpose Base also gives you these extras:

....VERSATILITY
one cutting fluid to do 90% of all jobs

....LUBRICITY
to withstand pressure and reduce friction

....ANTISEPTIC PROPERTIES
no skin sores, no rancid odors

....FILM STRENGTH
which gives you longer tool life

....COOLER WORK
which can be handled bare-handed

THIS ANTISEP USER CUTS 80% OFF COOLANT BILL AND INCREASES TOOL LIFE 83%!

Broaching internal 1¼" I.D. spline on prop shaft tube coupling of SAE 4135 steel, this customer saved $699.60 on oil costs since changing to Antisep A.P. Base. One part Antisep to 20 parts plain water was used. Straight cutting oil formerly used cost 54c per gallon. User reports cleaner operation, too, with less handling of oil. In addition he reports, "We now get 1100 pieces per broach grind with Antisep, instead of the 600 our straight cutting fluid gave us!"



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● The Greaves Machine Tool Company of Cincinnati, Ohio, a leading manufacturer of Milling Machines, has reduced the time required for boring their machine columns by 75% with Bunell Tooling.

● Greaves is also consistently obtaining a greater degree of precision and accuracy by the use of Bunell Boring Fixtures and Boring Bars (illustrated above). Time and labor savings like this speed production and help Greaves reduce costs and meet shorter delivery requirements of customers.

● Bunell's complete modern plant facilities and experienced engineering staff are available to help you with your tooling problems. Write for full information.

WRITE FOR FREE CATALOG which describes Bunell services, facilities and equipment.

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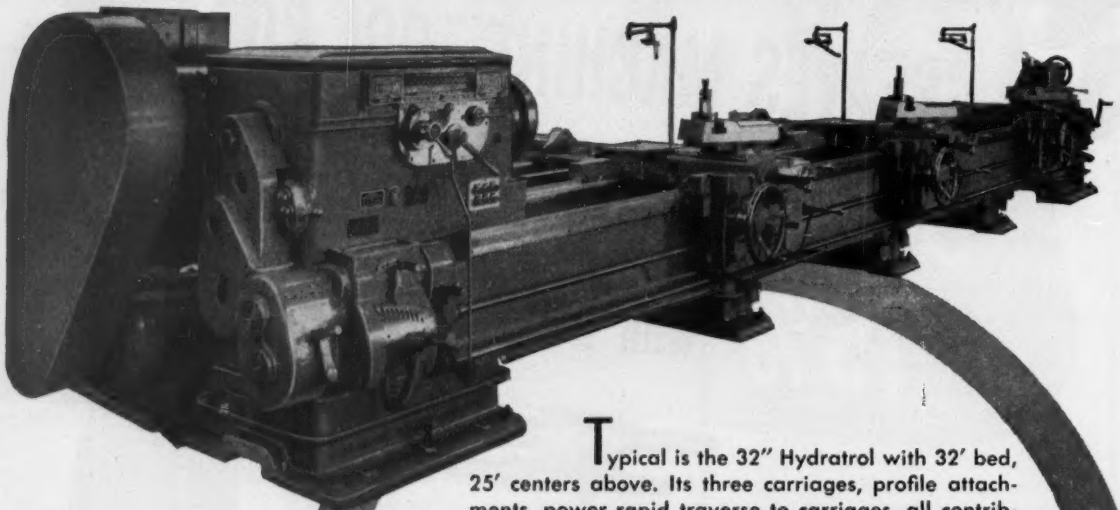


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- Self-compensating hydraulic friction clutches and brakes.
- Speed changes through positive clutches, gears remaining in constant mesh.
- Spindle release for chucking.
- Perfect, safety control lubrication with filtered oil.

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Heavy Duty 32"-36"
Heavy Duty 40"-50"

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SOLVED

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Baker Multi-Operation Machine utilizing standard Baker 7½ x 16 and 15 x 16 units and a 72" six-station power indexing table, performs drilling, chamfering, boring, counterboring, and tapping operations on clutch housings at the rate of 80 parts-per-hour at 100% efficiency.

STATION No. 1
LOAD and UNLOAD

STATION No. 2
VERTICAL UNIT
No. F Drill thru 2 holes .257
Drill thru 1 hole 15/32
Drill thru 5 holes 13/32
Drill thru 2 holes 25/64
Drill thru 3 holes "U" (.368)
HORIZONTAL UNIT
F Drill thru 8 holes
Mill Pad

STATION No. 3
VERTICAL UNIT
Comb. 15/16 drill & 1/16 x 45°. Chamfer 2 holes. Rough bore center bore 1 hole. Rough bore starter bore 1 hole.

STATION No. 4
VERTICAL UNIT
2 holes .438/.499 dia. ream
1 hole semi finish center bore
1 hole comb semi finish and finish starter bore
HORIZONTAL UNIT
8 holes ⅜ dia. & 90° chamfer

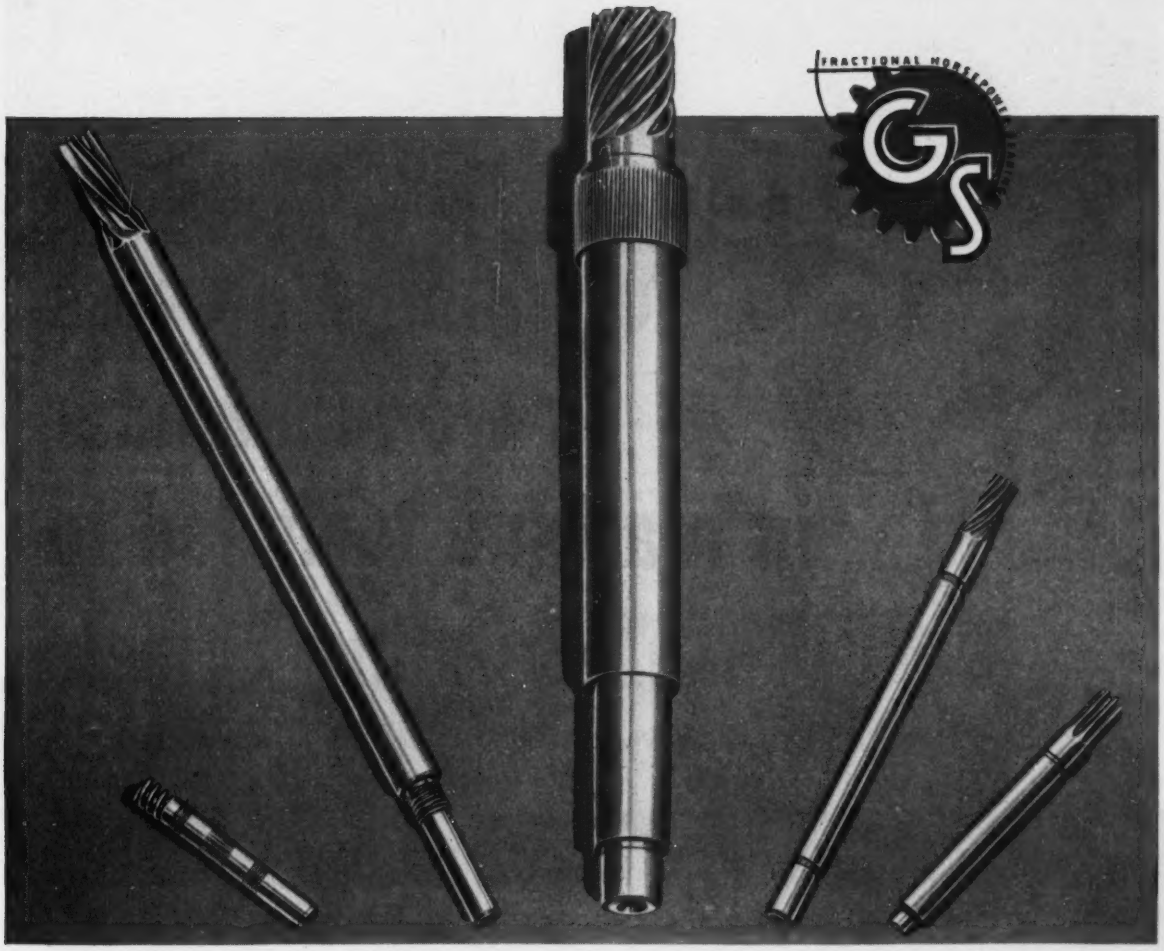
STATION No. 5
VERTICAL UNIT
2 holes ⅛ dia. x 90° chamfer
3 holes ½ dia. x 90° chamfer
2 holes spotface 1⅛ dia.
HORIZONTAL ANGLE UNIT
2 holes 15/32 drill
1 hole F (.257) drill

STATION No. 6
VERTICAL UNIT
3 holes 7/16—14 tap
2 holes 5/16—18 tap
HORIZONTAL UNIT
8 holes 5/16—18 tap

Baker Special Drilling Machines, composed of standard Baker units arranged to suit each individual problem, are designed for *productivity*. Units arranged in vertical, horizontal and angular planes perform multiple operations *faster . . .better . . . automatically . . .* with greater accuracy and efficiency. Consult Baker engineers for a better solution to your drilling problems.

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Entirely new approach to grinding process by world's leader in machine tools led to CINCINNATI Grinding Wheels

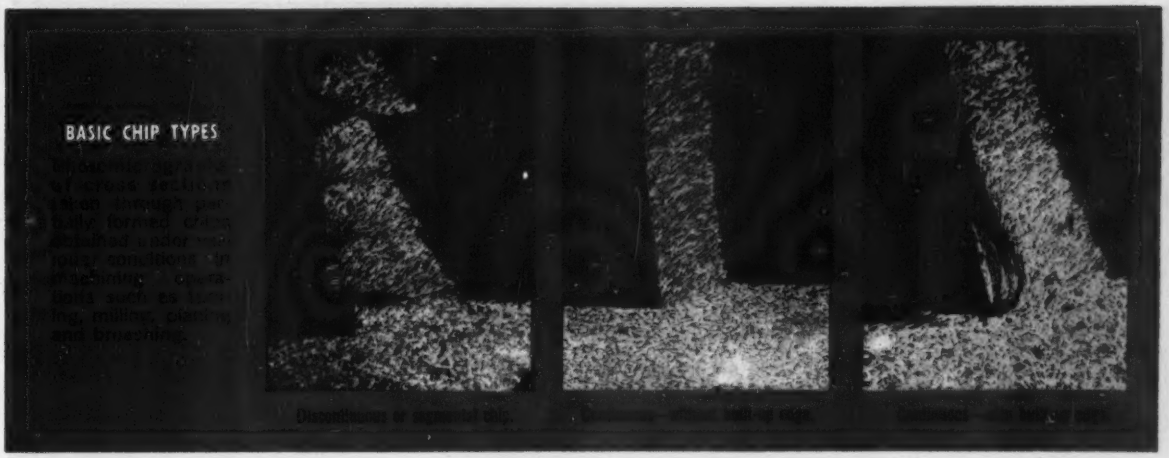
Cincinnati Grinding Wheels stem from a frank recognition of this basic fact: The grinding wheel is a true cutting tool.



Performance of experimental wheel is checked by member of research staff on one of several grinders in Cincinnati Grinding Wheels laboratory.

Years of research in The Cincinnati Milling Machine Co. laboratories, coupled with practical experience, proved beyond doubt, that the grinding process is a true metal cutting process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.





This new concept is the beginning of an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools producing true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. These men can serve you well.

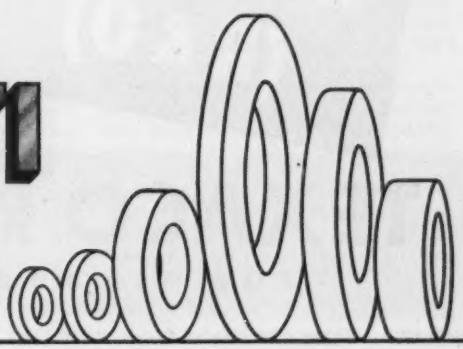
For a demonstration in your own shop on your own machines of how to get the most out of Cincinnati Grinding Wheels, just write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.



Cincinnati Grinding Wheels are manufactured in this new, completely modern plant.

FREE BOOKLET. Now available to industry is a brand new booklet entitled "A New Concept In Grinding Wheels." It's packed with important information for anyone interested in grinding operations. A copy is yours for the asking. Just write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
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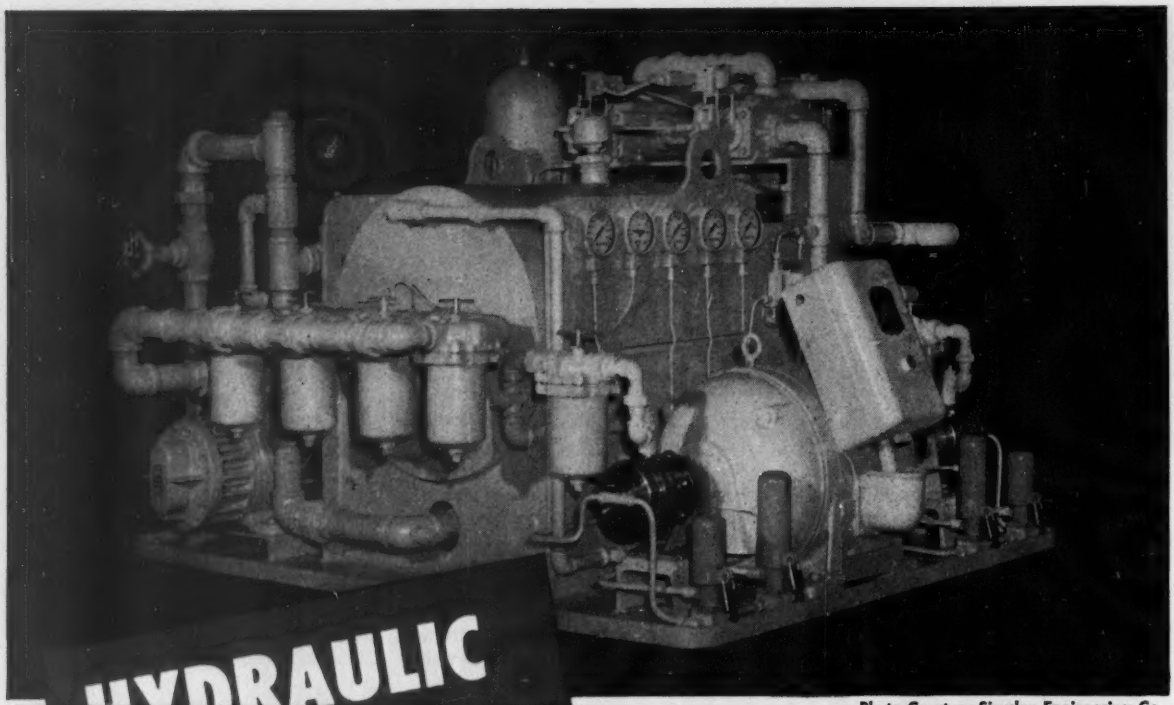


Photo Courtesy Simplex Engineering Co.

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Texaco Regal Oil (R&O) is a turbine-quality oil specially fortified and processed to prevent sludge, rust and foam. Tests show *it has more than ten times the oxidation-resistance of ordinary turbine-quality oil.* With *Texaco Regal Oil (R&O)* you can count on smooth, uninterrupted operation, longer pump life, lower maintenance costs. There is a complete line of *Texaco Regal Oils (R&O)* approved by leading hydraulic manufacturers.

For machining, use *Texaco Cutting, Grinding and Soluble Oils.* Whatever the metal or the method of working it, you can do it better, faster, at lower cost with Texaco.

Let a Texaco Lubrication Engineer help you select the proper Texaco Lubricants to give you the best results at lowest possible cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

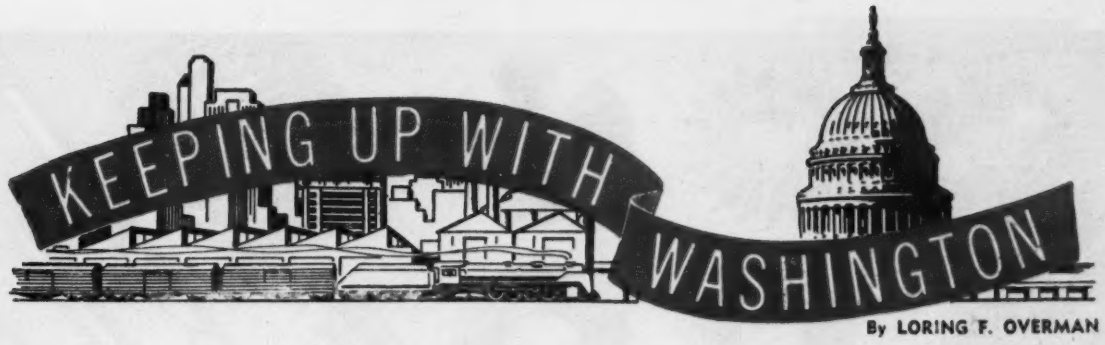
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By LORING F. OVERMAN

Machine Tool Objective Cited in Defense Mobilization Report

CURRENTLY popular in Washington is the expression "rounding out the mobilization base." The phrase is particularly acceptable because it covers such a broad range of possibilities. To those who believe that certain economies are desirable in defense matters, the "rounding out" idea suggests a reappraisal of the situation, possibly some trimming of budgets.

"Rounding out" could also mean picking up loose ends, covering any phases still hanging fire, or changing course to bring the defense effort into line with new developments. In the Seventh Quarterly Report to the President by the Director of Defense Mobilization, the twofold objective of the defense program is expressed as follows:

"From the beginning, defense mobilization has had an objective parallel with that of strengthening its military forces—the completion of a *mobilization base* of industrial facilities which would enable us to swing rapidly into full-scale military production at the beginning of any future war." The outline goes on to explain that in past crises our mobilization base has been built after the outbreak of hostilities. As a result, the production of armament had to wait for the expansion of industrial capacity.

"Since Korea," the Quarterly Report continues, "we have achieved a record-breaking expansion in many of the industries basic to defense. From now on the problem is one of identifying the specific gaps that still remain in the mobilization base, and of then closing them."

THE Report lists "the three most critical categories which are deficient." The machine tool industry no longer heads the list. It occupies the No. 2 spot. Items cited as critically deficient are:

1. Supply of highly strategic materials which would be in particularly heavy demand in the event of war.

2. Specialized machine tools and other long lead-time equipment which would be needed for all-out production of military goods.

3. Plant capacity, including supporting facilities, required to turn out the specialized materials and components that would be required in great quantity in any future war.

Machine Tool Objective Twofold—"Our machine tool objective," says the Report, "is twofold: First, to have on hand the long lead-time machine tools certain to be needed in the event of war; and second, to keep in being a high degree of machine-tool building capacity ready to meet the added needs of full mobilization.

"The industry has multiplied its output (of machine tools) more than three times above the level of June, 1950—now turning out almost $100,000,000 worth of machine tools each month. This momentum is rapidly reducing machine tool shortages. Unless a greater volume of new business is forthcoming, the output of the industry will soon begin to decline."

THE Report goes on to show that the industry-wide backlog of orders is twelve months, but that some manufacturers of highly specialized items have unfilled orders ranging up to two or three years. Manufacturers of simpler types have expanded their capacity more rapidly, and many have about filled their defense orders.

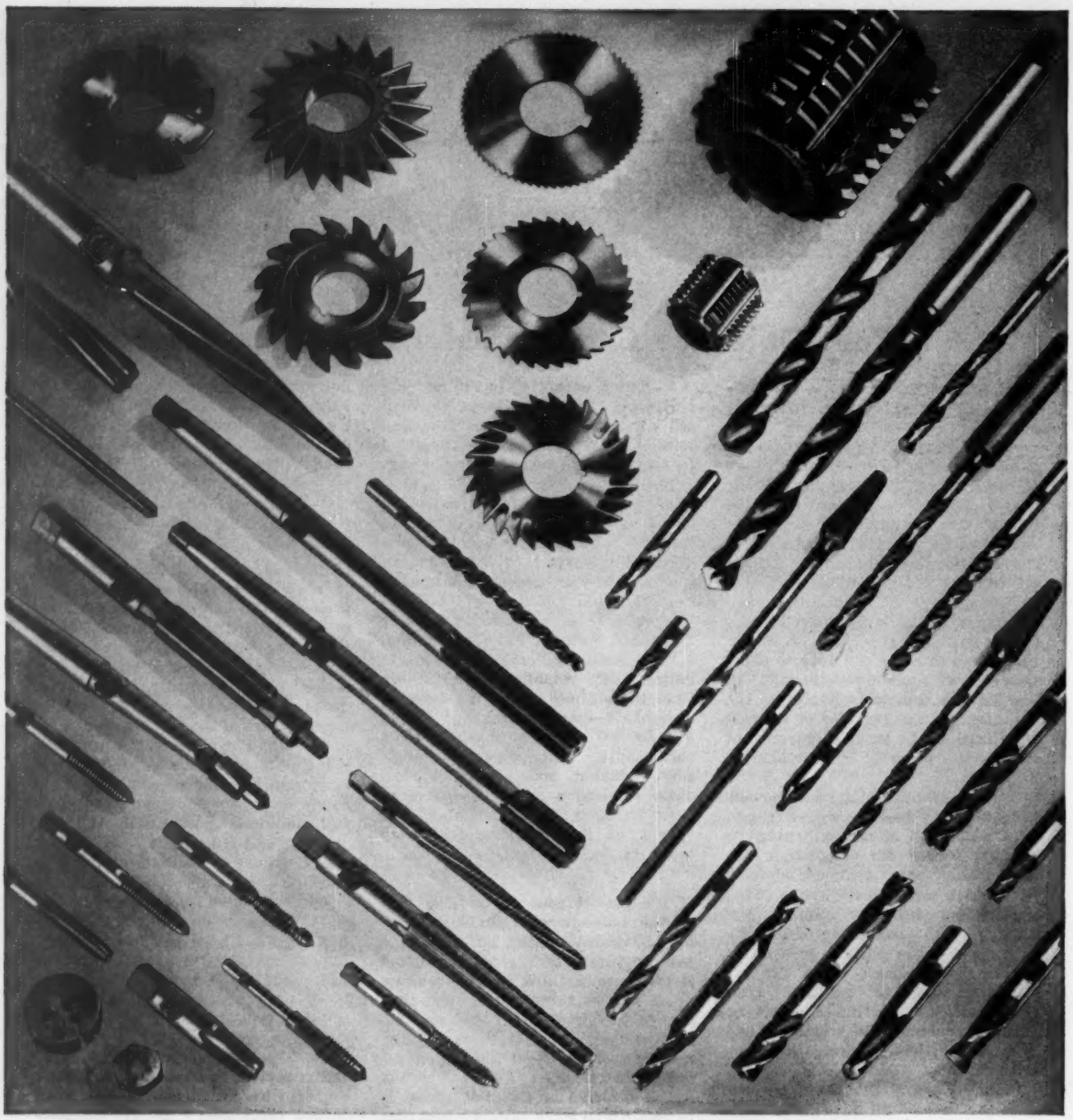
The problem of the first group is to obtain still more capacity, and that of the second is to keep plants working at present capacity or on a standby basis pending national need. To solve these problems, decisions must be made as to the specific types and quantities of machine tools that would represent a prudent investment for purposes of the mobilization base.

Recommendations Expected—Early completion of an expected report from the Advisory Committee on Production Equipment was forecast by the appointment, in mid-October, of Ralph S. Howe as special assistant to the Defense Production Administrator on matters concerned with machine tools and long lead-time production equipment. In his new capacity, Mr. Howe will work closely with the Advisory Committee on Production Equipment, appointed last May to make its study, and now headed by Harold Vance, chairman of the board and president of the Studebaker Corporation. Mr. Howe will also continue as director of the Metal-working Equipment Division of the National Production Authority.

THE purpose of the Committee is to review Federal policies and programs and to make recommendations to the ODM Director on the availability of production equipment to meet defense production requirements; and the maintenance of adequate capacity to produce this equipment as part of the mobilization base, and of stand-by production equipment —including methods of modernization, rotation, and disposition of obsolete tools and equipment—to meet full mobilization requirements.

What and How Much?—To assist the Committee in determining the needs for machine tools, studies are being completed covering potential wartime needs of many specialized items. Goals have recently been set, for example, for the specialized facilities required to produce military type power cranes and shovels, crawler type tractors, tapered aluminum sheets needed in some jet aircraft, electrical connectors, specialized electric motors, specialized copper wire products, and precision optical equipment. Studies are also being made of the potential wartime need for anti-friction bearings, turbines for naval vessels, hydraulic presses, heavy steel and aluminum castings, heavy forgings, heavy steel plate, various forms of aluminum needed for aircraft, and specialized refinery equipment needed for making aviation gasoline.

"Once the difficult problem of estimating requirements has been solved, the question arises as to how sufficient private investment can be obtained," observes the Report. "By their very nature, the additional facilities needed would not be fully utilized, and therefore perhaps not profitable, before or after a wartime need. Where deficiencies are revealed, all means of making them up will be explored."



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Nation-Wide Acclamation of the Machine Tool Industry

MACHINE tools are basic to industrial progress and national defense but this fact is recognized by relatively few people outside of the mechanical industries. Lack of understanding in government circles concerning the vital importance of machine tools has always seriously hampered the machine tool industry in its efforts to meet urgent demands for war production. Obviously there has been need for an educational job to be done outside of the mechanical industries.

Such an opportunity was provided by October MACHINERY which recorded the Fiftieth Anniversary of the National Machine Tool Builders' Association. A special section featured articles written by industrial and political leaders stressing the importance of machine tools as the master tools of progress and protection. Advance proofs of those articles were supplied to local newspaper editors in industrial cities and towns through the enthusiastic cooperation of many members of the N.M.T.B.A.

The newspaper responses were most gratifying. Editorials and feature articles appeared in daily newspapers in practically all cities where machine tools are built. The *Reporter* of Springfield, Vt., and the *Daily Eagle* of Claremont, N. H., promoted "Machine Tool Progress Week" from October 12 to 18, and both papers published two entire pages devoted to articles and illustrations. The New York *World Telegram and Sun* carried a half page feature article.

An editorial which appeared in the Rochester *Democrat and Chronicle,* read in part: "For those of us whose familiarity with tools is confined mainly to tack hammers and screwdrivers, the great mechanical world of the machine tool industry is just a remote nebula. We need to have it explained to us that all our modern machines are made by other machines, which are made by other machines. Where and how it begins we do not know, but it is at least comprehensible that machine tools are the machines that make the machines. Without them, obviously, no machines could be made. . . .

"Probably no industry, when you come to think of it, better reflects the growth of the industrial age than the machine tool industry. It reflects the change, almost overnight, from the hand mechanics of past centuries to the mass production of today."

The editor of the Elkhart *Truth* pointed out that at the outbreak of the Korean conflict it was apparent that the Federal Government had not learned war production lessons from the two World Wars. This editor made the significant statement, "You cannot build weapons until you have first built machine tools to produce

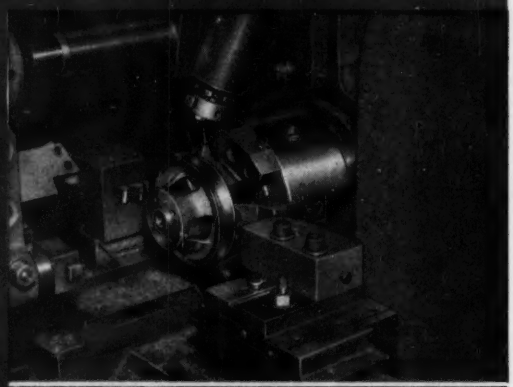
POTTER & JOHNSTON TOOLING

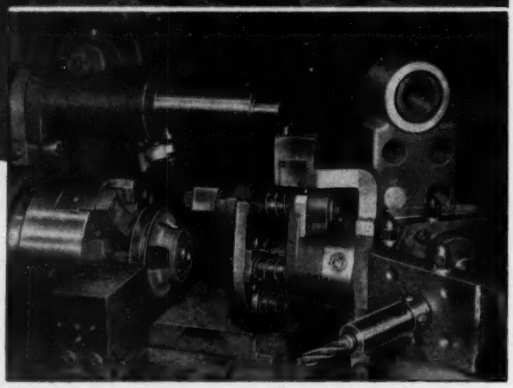
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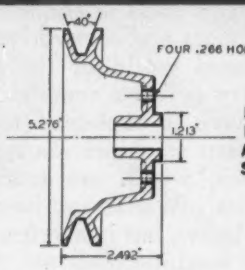
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Nation-Wide Acclamation of Machine Tool Industry

Concluded

them. . . . Fourteen precious months drifted by before machine-tool makers got the governmental cooperation they asked. Meanwhile they were handicapped in other ways, one of the Armed Services in particular changing its mind almost weekly, cancelling orders right and left.

"Specifications were puzzling; one producer was asked to supply an instruction manual so complicated it would have cost more than the machine tool it was supposed to explain."

One of the comments made by the editor of the Erie *Daily Times* read, "The man in the street can thank his lucky stars that American inventiveness, ingenuity, resourcefulness, and organizing ability are abundantly in evidence that the machine tool industry has continued to move ahead and to provide the very essential first cog in the gears of industrial progress whether in war or in peace.

"We believe it is high time the people of this nation understand the great achievements of this tremendous industry and salute it in this year of its Golden Anniversary."

A small portion of the editorial in the Worcester *Telegram* read, "What would we do without automobiles and sewing machines and tractors and vacuum cleaners and separators and countless other machines and mechanical devices, great and small?

"All of these machines were invented —but they were also manufactured. They were not produced by magic. They had to be made, and they were made largely by machine tools. Thus machine tools form the base of all of our marvelous industrial production. The factories which make machines can't do their work until they get machine tools; and so machine tools are involved in every manufactured product in the land."

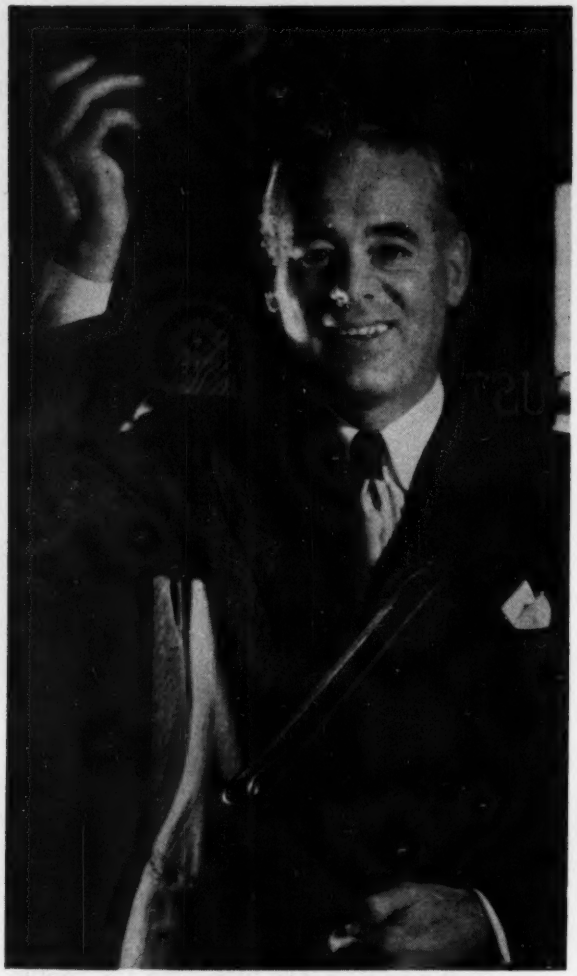
The editor of the Moline *Daily Dispatch* made the striking comment, "First, there has been a reluctance to accept the machine tool in peacetime production for fear it would replace humans and cripple the economy with unemployment. Fortunately, that feeling is fading away because experience has shown that machine tools mean increased productivity which, in turn, means more, not fewer jobs. As Herbert Hoover said in an address this year, 'There are hundreds of jobs in the garages of today for every one in the livery stable of yesterday.' And Philip Murray, C.I.O. president, commented recently that he knew of no machine invented that has—in the long run—cut the nation's payroll army."

Tributes to machine tools in language understood by the general public!

Charles O. Herb

EDITOR

A man who can help you get STEEL!



In these days of great demand, the help of an experienced steel man is especially valuable. Did you realize that the services of such a man are available to you without cost or obligation? This man is your Ryerson steel service representative—a specialist in getting available steel to you quickly.

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But your Ryerson service man is always ready to assist you . . . ready to help you scour the country from coast to coast to get the steel you need. So, talk over your steel problems with him the next time he calls.

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High-Speed Hobbing Gives Remarkable Results

By JOHN W. RAPP
Gear Specialist, Transmissions Operations
Allison Division, General Motors Corporation
Indianapolis, Ind.

Increased Production, Longer Hob Life, Improved Accuracy, and Better Finish of Gears have Resulted from Hobbing the Teeth at Cutting Speeds up to 350 Feet per Minute and Feeds of 0.115 Inch per Revolution

PRODUCTION of hobbed gears has been increased up to 200 per cent, and hob life has been lengthened as much as 100 per cent by employing higher hobbing speeds in the Allison Transmission Plant than are used in conventional practice. Contrary to general opinion, hobbing speeds of 250 feet per minute or more do not—in most cases—result in greater tool wear. Also, with higher cutting speeds, greater accuracy and a better profile finish of the hobbed gears can be obtained.

In comparing gear-hobbing with other types of modern machining operations, it is found that hobs are normally operated at relatively low surface speeds. As a result, requirements for pro-



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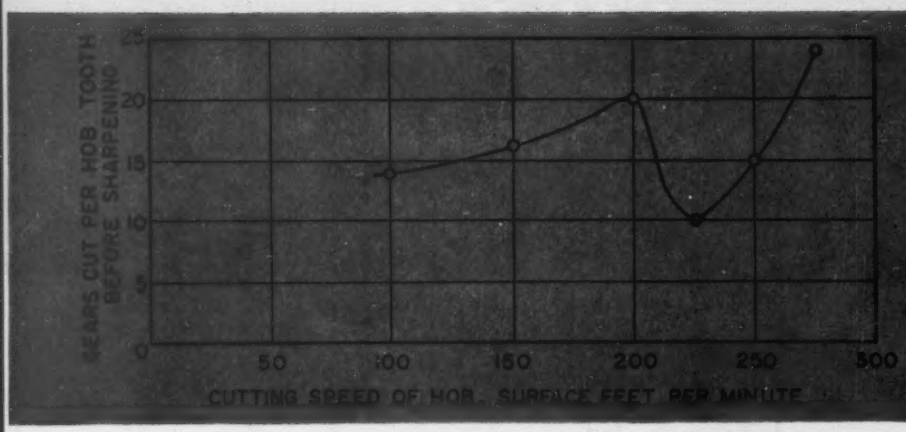


Fig. 1. Effect on hob life of various cutting speeds in hobbing thirty-one-tooth spur gears of 6 diametral pitch made from S.A.E. 9310 steel having a Brinell hardness between 225 and 250.

duction increases are usually accomplished by employing multiple-thread hobs or higher rates of feed. Both of these methods have distinct disadvantages, which become more pronounced and detrimental as the amount of accuracy required is increased.

Multiple-thread hobs, if properly used, give excellent results when semi-finishing gears that have to be subsequently ground or shaved. The accuracy and finish obtained with such tools are generally not satisfactory for the finish-hobbing of gears. In addition, the higher tool cost and precision sharpening methods required are often undesirable. Higher rates of feed usually result in lower quality, both as to accuracy and surface finish, and, if excessive, sometimes result in higher tool costs.

An intensive research program involving hundreds of tests has been in effect for the past year at Allison. All tests were made with single-thread hobs, both ground and unground, on machines actually in the production lines. A wide range of steels having different hardnesses, various size gears, and several types of machines were analyzed and tested. Among the metals tested were S A E 1113, 1141, 4140, 4340, 8620, 8740, and 9310 steels ranging in hardness from 125 to 375 Brinell. Gears and splines hobbed in the tests varied from 4 to 16/32 diametral pitch, with pitch diameters ranging from 3/4 inch to 20 inches. Climb-hobbing was employed for all tests, and the hobs were removed from the machines for resharpening when 0.020 inch of stock had to be ground from their cutting edges.

As expected, it was found that there is a complex relationship between the hardness of the steel being cut, the cutting speed and feed of the hob, and the pitch and diameter of the gear being produced. Also, there is a critical speed and feed at which tool life is very poor. It has always been customary to reduce the feed and speed below these critical values, to a point where satisfactory tool life is obtained. However, an important fact discovered from these tests is that

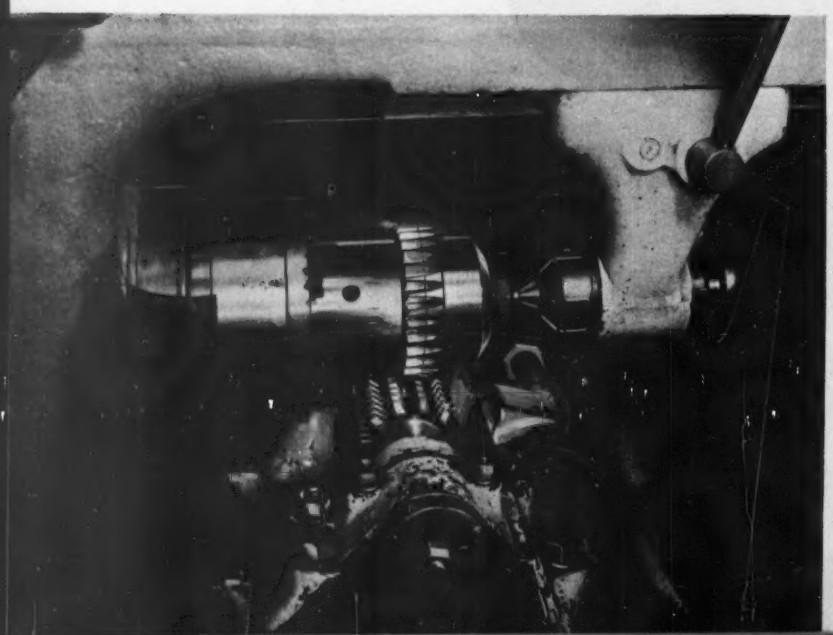


Fig. 2. Set-up employed on a 14-inch horizontal hobbing machine to obtain the results shown graphically in Figs. 1 and 3. Two of the 5/8-inch wide spur gears are hobbed at a time.

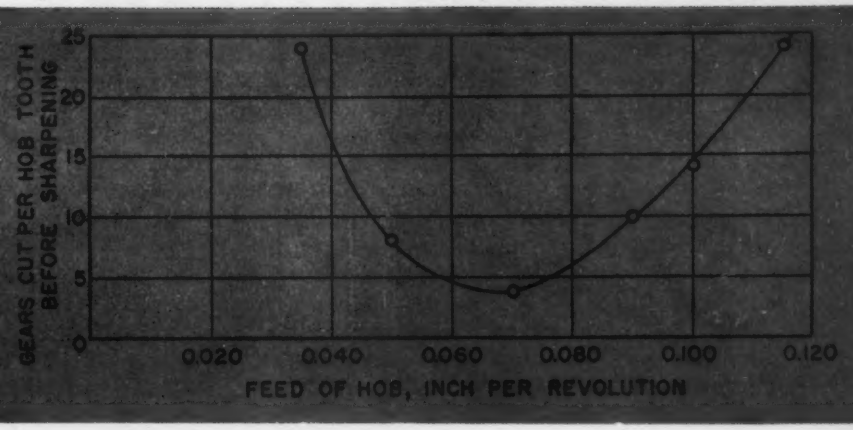


Fig. 3. Tool life results obtained in the set-up seen in Fig. 2 when the cutting speed was maintained at 275 feet per minute and the hob feed varied from 0.030 to 0.115 inch per revolution

by *increasing* the speed and feed above the critical values, the tool life will be longer than at any lower speed.

This is borne out by the curve shown in Fig. 1, which is based on results obtained in hobbing thirty-one tooth spur gears of 6 diametral pitch, 25-degree pressure angle, and 5/8-inch face width. The gears, made from S A E 9310 steel of 225 to 250 Brinell hardness, are hobbed two at a time (requiring a 1 1/4-inch length of cut) on a 14-inch horizontal hobbing machine, Fig. 2. About 0.025 inch of stock is left on the surfaces of the gear teeth for a subsequent finish grinding operation.

From Fig. 1 it can be seen that the shortest tool life was obtained at a cutting speed of 225 surface feet per minute. Instead of reducing the speed to 200 feet per minute, as has been customary in past practice, the speed was increased to 275 feet per minute, and an even longer tool life was obtained. Maintaining the speed constant at 275 feet per minute, the feed was progressively increased from 0.030 to 0.115 inch per revolution, with the tool life results shown in Fig. 3. It can be seen that the shortest hob life was obtained when a feed of 0.070 inch per revolution was employed.

Employing a cutting speed of 275 feet per minute and a feed of 0.115 inch per revolution, two gears are now climb-hobbed in a cutting time of two minutes forty seconds. The previous hobbing time was twenty-four minutes. In addition to this remarkable increase in production, the life of the hob was increased 50 per cent.

The reason for this amazing increase in tool life at high speeds lies in the constantly changing cutting action of the hob tooth and the type of chip produced. At slow speeds the hob tooth is in contact with the chip and work for a longer period of time, resulting in more heat transfer to the hob tooth. Hence, the faster the hob tooth is in and out of the work, the cooler the hob will remain. These tests have shown that high speeds leave the work and hob cooler, while at the same

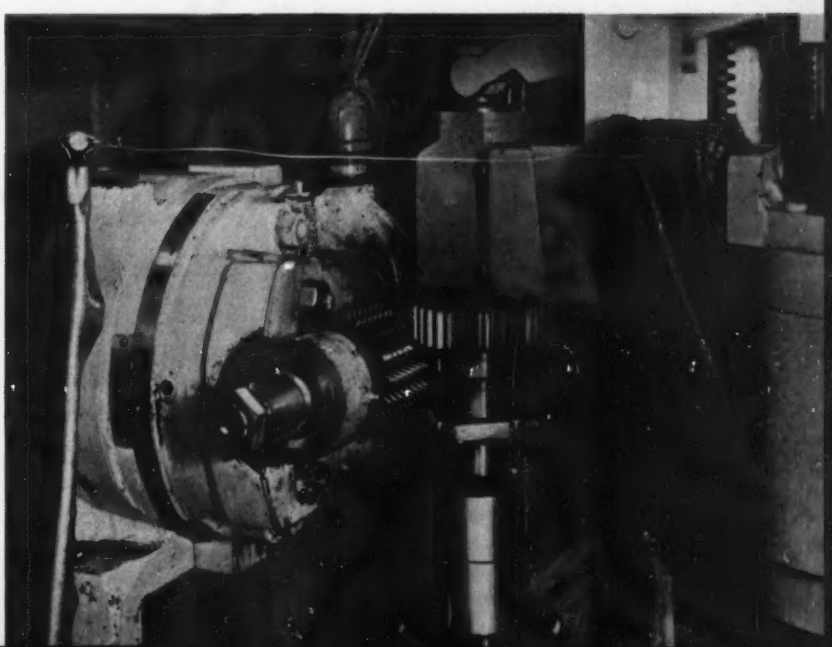


Fig. 4. Hobbing time has been reduced from twelve to five minutes, with no shortening of tool life, by increasing the cutting speed to 310 feet per minute on this vertical gear-hobber.

time increasing the temperature of the chips removed during hobbing.

In finish-hobbing gears, when a smooth surface finish must be produced on the gear teeth, a cutting speed of 275 feet per minute and a feed of 0.035 to 0.040 inch per revolution give excellent results and an increase in tool life of 70 per cent over that obtained with a cutting speed of 100 feet per minute and similar feeds. In hobbing gears that have to be ground or shaved, a speed of 275 feet per minute and a feed of 0.115 inch per revolution will result in about the same increase in tool life, and produce a surface that is ideal for subsequent shaving or grinding.

Production time has been halved by increasing the speed to 170 feet per minute in finish-hobbing a 150-tooth spline of 16/32 diametral pitch, 30-degree pressure angle, and 1/2-inch face width. The spline is hobbed on an S A E 8740 steel shaft having a hardness of 32 to 36 Rockwell C. Hobbing time is now seventeen minutes, compared to the previous time of thirty-five minutes, and tool life is equal to that obtained at lower speeds.

Illustrated in Fig. 4 is a set-up on a vertical hobbing machine in which an S A E 9310 steel gear of 225 to 250 Brinell hardness is climb-hobbed at a cutting speed of 310 feet per minute prior to shaving. This spur gear has thirty-one teeth of 8 diametral pitch and 25-degree pressure angle, with a 1 3/16-inch wide face. From 0.007 to 0.008 inch of stock (measured over pins) is left on the hobbed gear teeth for shaving. Each gear is hobbed in five minutes, and there has been no shortening of tool life compared to the previous hobbing speed that required twelve minutes.

Spur gears 20 inches in diameter are seen being hobbed two at a time in Fig. 5. The gears, made from S A E 8649 steel of 34 to 38 Rockwell C, have seventy-nine teeth of 4 diametral pitch, 20-degree pressure angle, and 3-inch face width. This is a semi-finishing operation, in which 0.090 inch of stock (measured over pins) is removed and approximately 0.013 inch is left for shaving. By increasing the cutting speed to 170 feet per minute, hobbing time was reduced from 124 to 50 minutes, and tool life was lengthened by 67 per cent.

In hobbing a 15-degree helical gear prior to shaving, cutting time has been reduced from fifty to fifteen minutes by increasing the cutting speed to 210 feet per minute with no shortening of hob life. This gear has fifty-eight teeth of 6 normal diametral pitch, and a face width of 2 1/4 inches. The helical gears are made from S A E 8620 steel of 150 Brinell hardness.

These are but a few typical examples of the many excellent results obtained with high-speed hobbing. One department at Allison, producing ordnance tank transmission gears, has increased over-all gear-cutting production by 100 per cent with no additional operators and two less machines. In addition, tool life has been increased by 33 1/2 per cent. As a result of careful analysis of each job, gears are being hobbed in high production at speeds well up into the carbide range of 250 to 350 surface feet per minute. In many individual cases, tool life has been increased 50 to 100 per cent, production lifted 100 to 200 per cent, and higher quality gears obtained. It is believed that the possibilities of high-speed hobbing are unlimited, and tests are now being conducted with hob speeds in the 400 to 600 feet per minute range. In this regard, various methods are being studied of maintaining proper cutter and work temperatures.

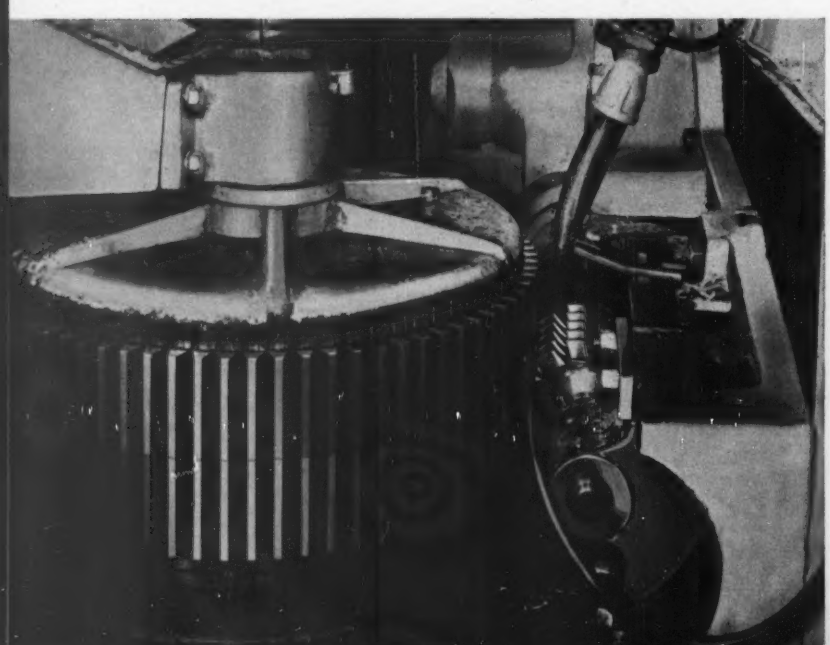
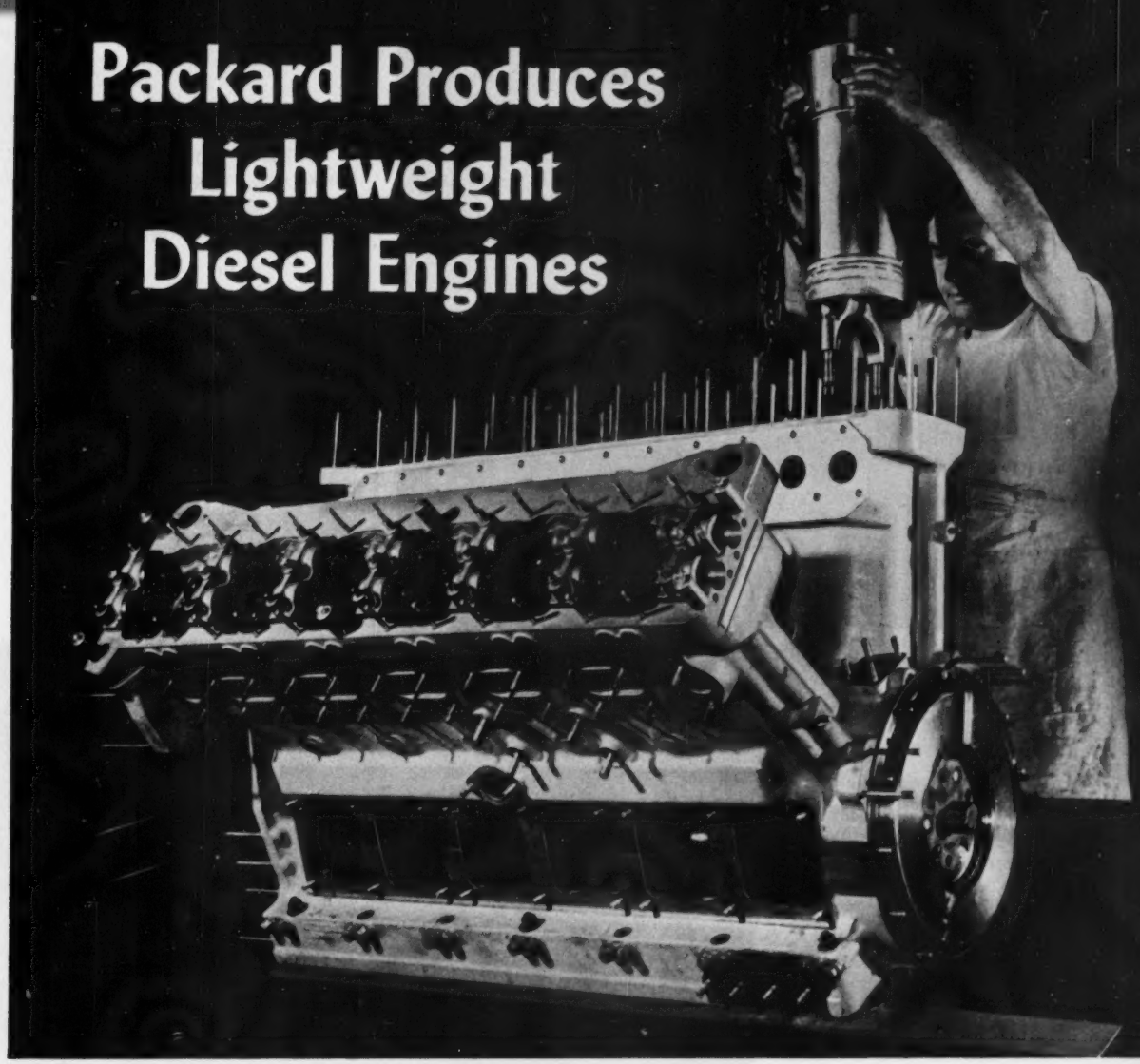


Fig. 5. Tool life has been lengthened 67 per cent, and hobbing time reduced from 124 to 50 minutes, by increasing the cutting speed to 170 feet per minute in hobbing two 20-inch diameter spur gears.

Packard Produces Lightweight Diesel Engines



By CHARLES H. WICK

Lightweight Marine Diesel Engines Now being Manufactured for the United States Navy have Many Unique Design Features that Necessitate Unusual Set-Ups and Close-Tolerance Machining Operations

REMARKABLE marine Diesel engines of advanced design—weighing only one-third as much as present types—are now being manufactured by the Packard Motor Car Co., Detroit, Mich., for the United States Navy. Two models, a straight six-cylinder and a 60-degree V-12, are included in the high-speed, water-cooled, four-cycle engines. Equipped with turbo-chargers, the engines are rated at 300 and 600 B.H.P., respectively, for continuous duty at 2000 R.P.M.

In addition to their light weight, another important feature of these engines is the adoption of a basic standardized cylinder assembly design which permits complete interchangeability of most major parts. Among these interchangeable parts common to both engine models are the integral cylinder head and wet liner assemblies; pistons, wrist-pins, and piston-rings; intake and exhaust valves, valve springs, and valve guides;

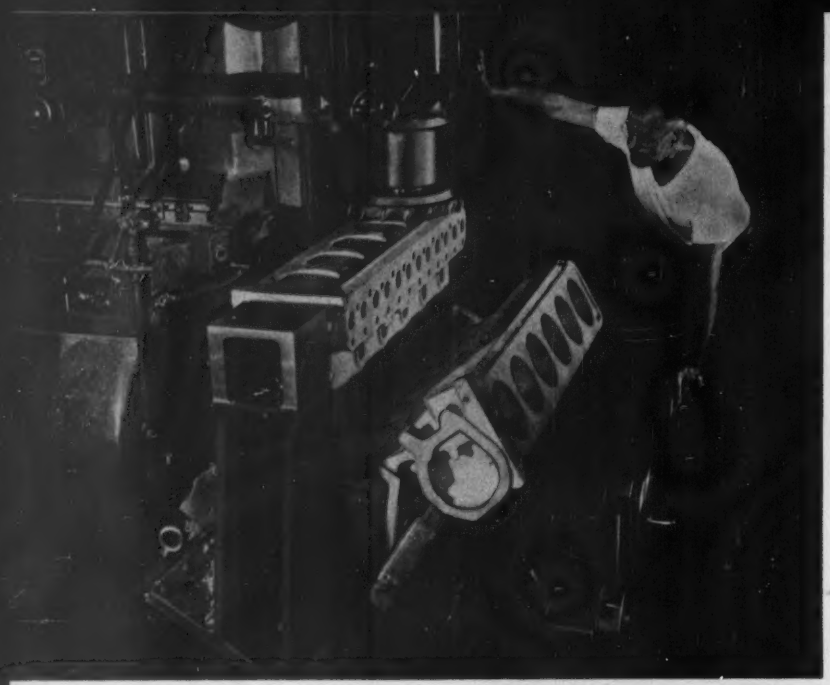


Fig. 1. Banked cylinder surfaces of the cast-aluminum V-12 engine block are rough-milled on this machine. About 5/16 inch of stock is removed.

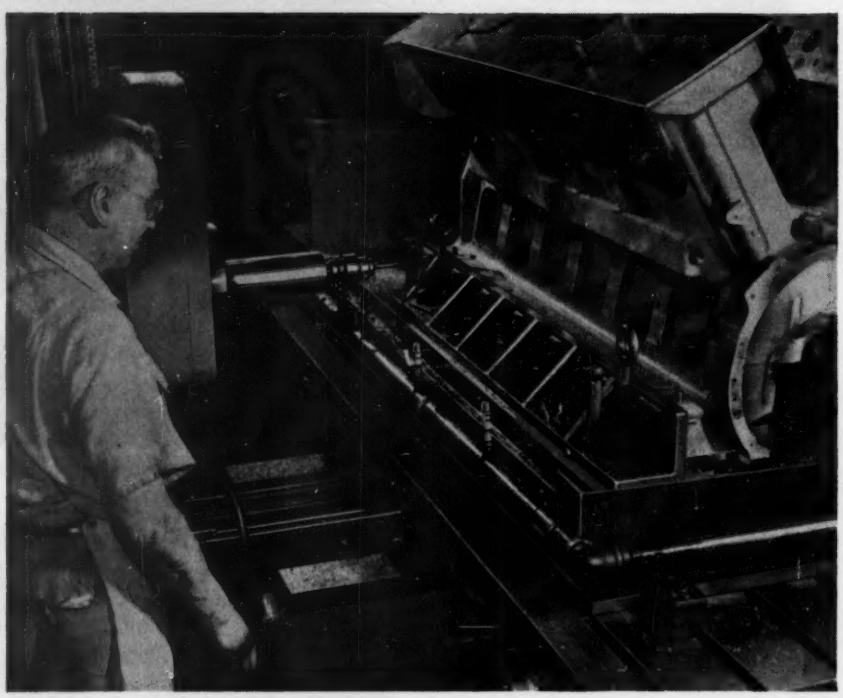


Fig. 2. Lateral tie-bolt holes are drilled and reamed in the cylinder block on this horizontal boring, drilling, and milling machine.

and main and camshaft bearings. An outstanding feature is complete interchangeability of crankshafts on both the six-cylinder and V-12 engines. Such unique design features have necessitated unusual production set-ups and close-tolerance machining operations, some of which will be described in this article. Because of the limited initial production, many tool-room machines and set-ups are currently being employed in manufacturing the engines.

Extensive use has been made of aluminum alloys in the construction of the engine without sacrificing strength. For example, the cylinder block and upper half of the crankcase are cast integrally. The casting is of extremely rigid construction with massive bulkheads at the main bearing lines. The top surface of one cylinder bank on the huge V-12 cylinder block is being rough-milled in the set-up shown in Fig. 1. In this operation, performed on a Cincinnati Hydro-Tel vertical milling machine, the aluminum block is held at an angle of 30 degrees on a fixture mounted on the milling machine table. The large casting is located by means of dowels and bushings and secured to the fixture by means of strap clamps.

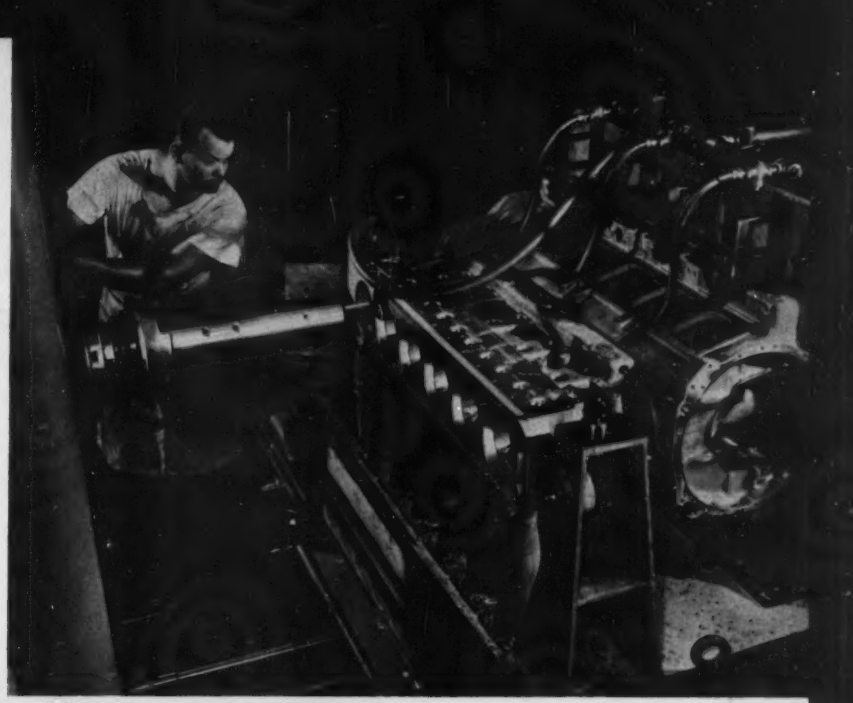


Fig. 3. Cylinder block for the six-cylinder Diesel engine is bored within plus or minus 0.001 inch of required size on this horizontal boring machine.

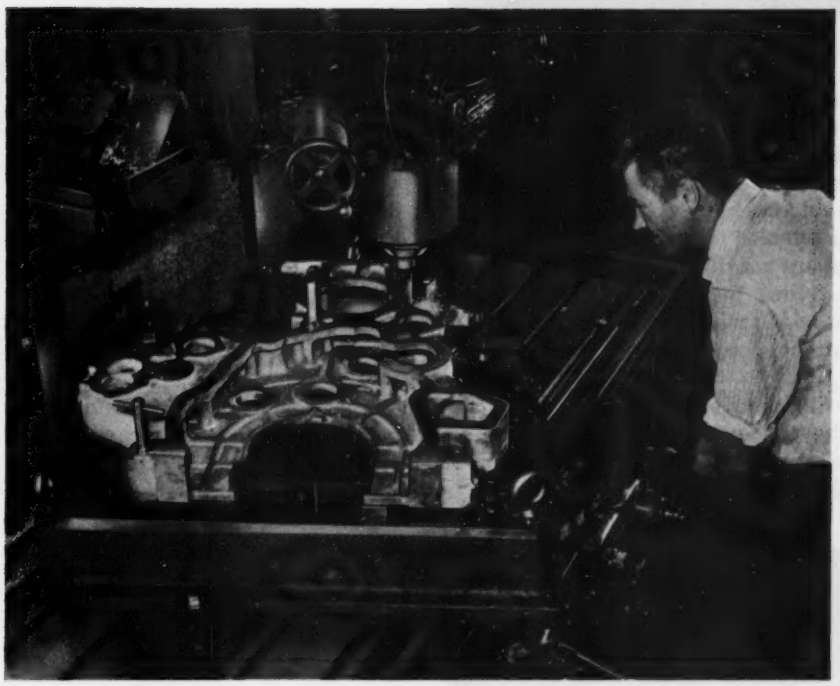


Fig. 4. Sling pads that facilitate handling of the cast-aluminum accessory drive housing are cut on this vertical milling machine.

Approximately 5/16 inch of stock is milled from the top surface of each cylinder bank in two passes, leaving 0.050 inch of stock for removal in two semi-finish milling cuts, and another 0.010 inch which is cut from the surface after boring the cylinders. The milling cutter, 14 inches in diameter and containing eighteen carbide-tipped inserted blades, is rotated at 564 R.P.M. During rough-milling, the machine table is traversed past the cutter at the rate of 7 inches per minute.

Lateral tie-bolt holes in this cast-aluminum cylinder block are drilled and reamed on the Lucas horizontal boring, drilling, and milling machine seen in Fig. 2. The cylinder block is secured to the work-holding fixture (fixed on the machine table) by means of strap clamps, and an angular drill-bushing plate is bolted to the fixture. Both right- and left-hand bushing plates are required, and they are interchanged on the fixture when the work is rotated 180 degrees to drill from the opposite side.

Twist drills, 3/8 inch in diameter and varying up to 6 inches in length by 1 1/2-inch increments, are successively held in the horizontal boring machine spindle. The drills are rotated at 680

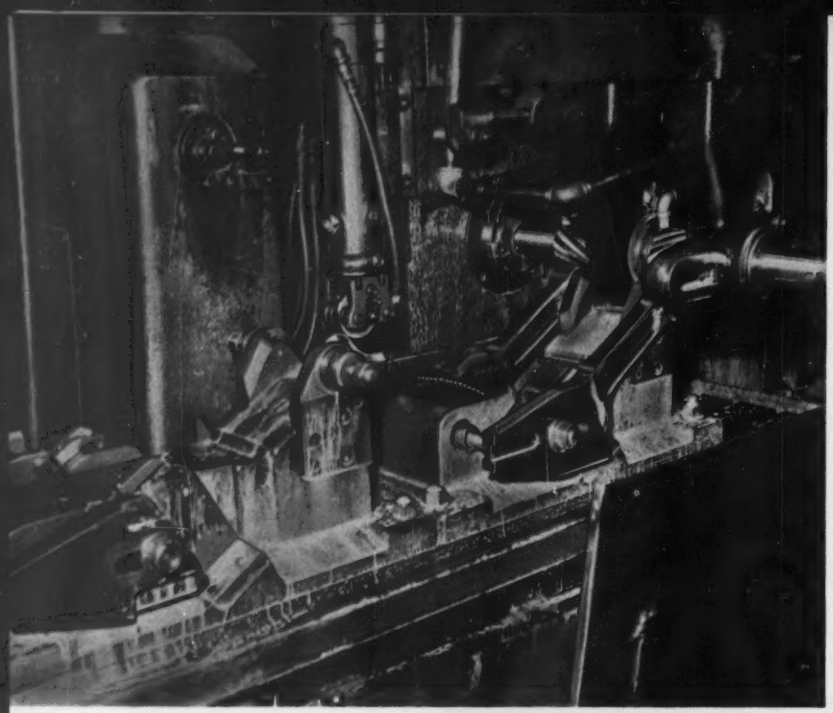


Fig. 5. Diesel-engine connecting-rods are contour-machined two at a time on a tracer-controlled milling machine. A second fixture is loaded during milling.

R.P.M. and fed 0.006 inch per revolution into both sides of the cylinder block. Accurate center spacing between tie-bolt holes along both sides of the block is obtained by placing end measuring rods of the required length in a locating trough provided on the machine table. After the bearing caps have been assembled to the cylinder block, the tie-bolt holes are redrilled from both sides of the block and then line-reamed from one side only. A reamer 0.445 inch in diameter and 22 1/2 inches in length is required for this finishing operation.

The set-up employed for boring the six-cylinder block is shown in Fig. 3. The table of this Giddings & Lewis horizontal boring machine carries the special fixture required for accurate machining. Mounted on the front edge of the fixture (and seen in the center of the illustration) are six jacks for supporting the work. The large vertical plate bolted to the rear of the fixture carries the clamping straps and bronze bushings for piloting the boring-bar. Dowels and bushings are provided on the fixture for locating the cylinder block.

Stock removed from the bore diameters varies from about 3/8 inch on most six-cylinder blocks to as much as 3/4 inch on some V-12 blocks. Since each bore must be machined to four different diameters, the rough- and semi-finish boring-bars are equipped with four carbide-tipped tools. The finishing bar carries four boring tools and four cam-fed tools—of the lat-

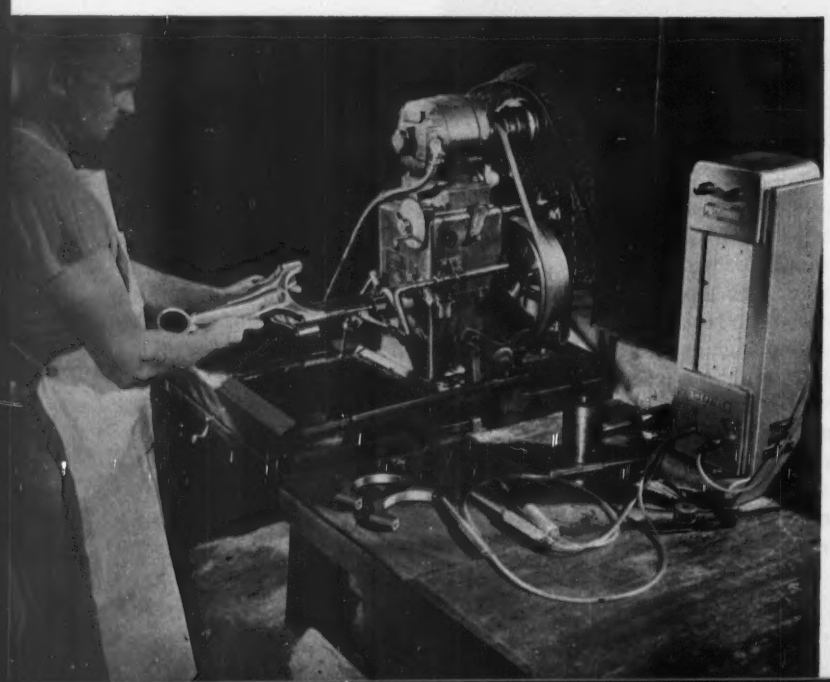


Fig. 6. Set-up employed to hone and inspect bolt holes in connecting-rods and caps. A tolerance of 0.0002 inch is held on roundness and straightness.

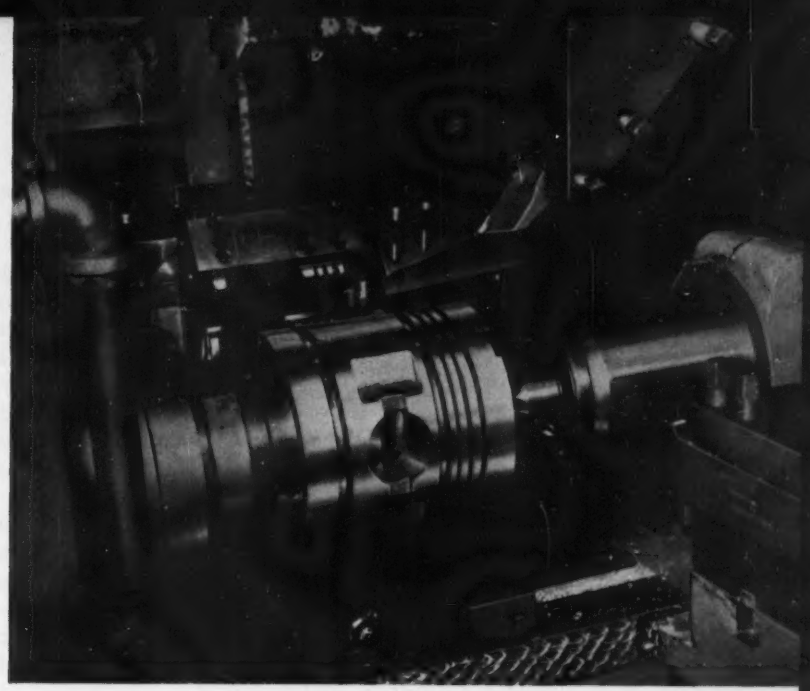


Fig. 7. Aluminum pistons for the Diesel engines are turned, chamfered, grooved, and contoured on this automatic lathe equipped with thirteen tools.

ter, two are for under-cutting and two for chamfering. Approximately 1/8 inch of stock is left on each diameter after rough-boring, and 0.030 inch after semi-finish boring. During rough-boring, the tools are rotated at 150 R.P.M. and the work is fed at the rate of 0.7 inch per minute. A rapid traverse of 3.1 inches per minute is employed to bring the work into cutting position. Bores are maintained within plus or minus 0.001 inch of the required size in this operation.

Another large aluminum part that is used in the Diesel engines, and which results in a considerable weight saving, is the accessory drive housing shown being milled in Fig. 4. If produced in steel, this casting would weigh 140 pounds—more than twice as much as the aluminum one used. In the operation illustrated, sling pads for handling the housing are being machined on a Cincinnati Hydro-Tel vertical milling machine. On a similar machine, a three-bladed fly cutter, 32 inches in diameter, is employed to machine the joint faces of the housing. Over-all thickness is maintained within plus or minus 0.0005 inch in this operation. From forty to fifty bars and seven different bushing plates are required to rough- and finish-bore the various accessory holes in the housing. Several of the holes must be bored to size within a tolerance of 0.0008 inch. All of these precision boring operations are performed on radial drilling machines.

A Cincinnati Hydromatic tracer-controlled machine, Fig. 5, is employed to contour-mill the connecting-rods for the Diesel engines. Two

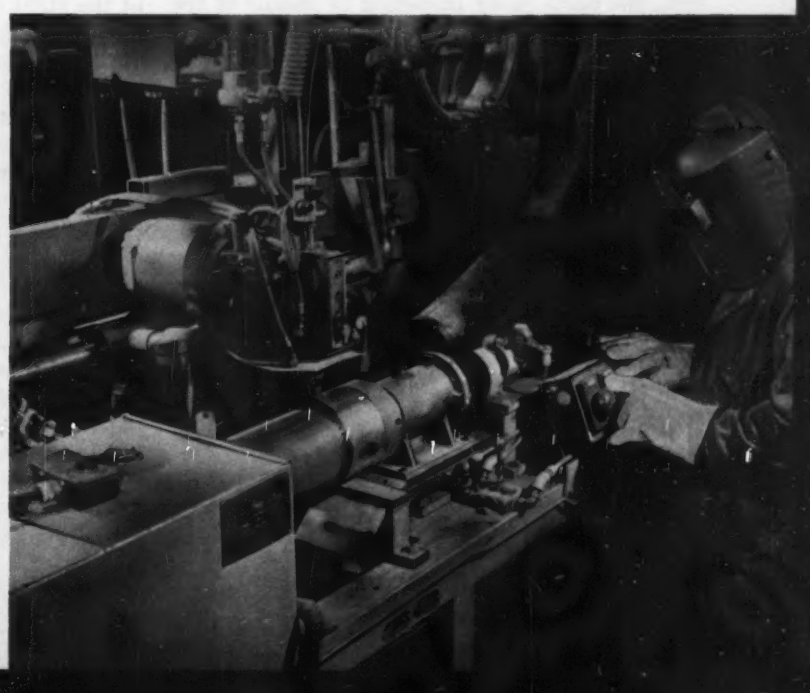


Fig. 8. Cylinder heads are automatically welded to the wet type cylinder liners by means of this shielded inert-gas metal-arc welding equipment

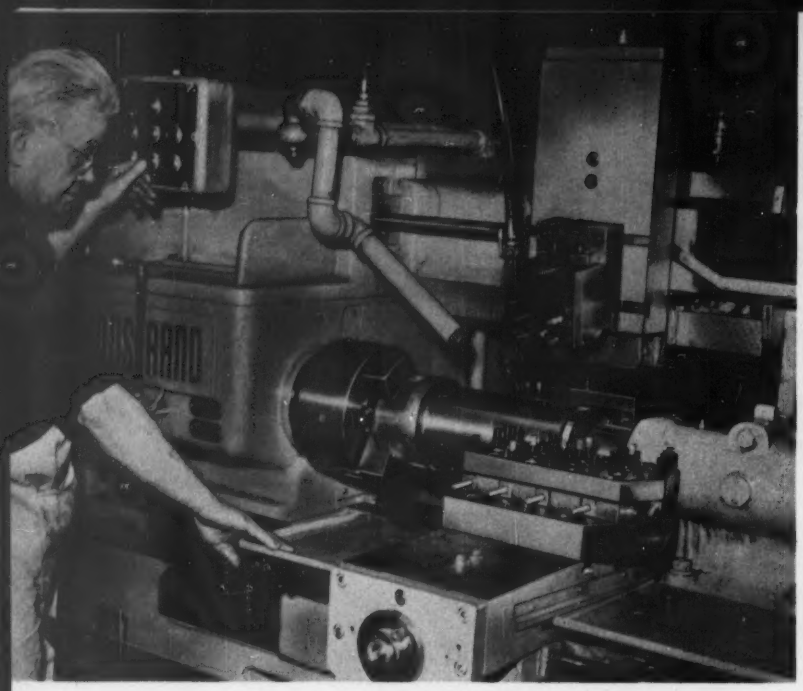


Fig. 9. Welded cylinder head and liner assemblies are turned, chamfered, grooved, and formed on this automatic lathe in two and one-half minutes.

rods are milled at a time, as seen at the right, while the fixture at the left is being unloaded and reloaded. The spindle, carrying the arbor on which the two cutters are mounted, is automatically moved vertically by hydraulic pressure under the control of the tracer valve during the cutting stroke of the machine table. A roller, seen mounted on the lower end of the tracer valve mechanism, engages the template bolted to the work-holding fixture. The spindle carrier is automatically raised before the rapid return of the table is begun. The contour of the template is accurately reproduced on the connecting-rods within plus or minus 0.001 inch.

Bolt holes in the connecting-rods and caps are finished on the Sunnen bench type honing machine shown in Fig. 6. Roundness and straightness of the holes are held to a tolerance of 0.0002 inch, the parts being inspected by means of the Sheffield Precisionaire two-column gage mounted at the right. Aluminum-oxide abrasive honing stones are employed, and about 0.002 inch of stock is removed from the bores. Although not as important as the roundness or straightness of the holes, a surface finish of about 10 to 15 micro-inches r.m.s. is obtained. A sulphurized mineral-base oil mixed with kerosene is employed as the cutting fluid for honing.

Pistons for the lightweight marine Diesel engines are aluminum alloy, permanent mold castings having a heavy formed-dome cavity. The dispersing cone on the piston dome causes the high-velocity burning mixture in the Diesel engine to "mushroom," and the resulting high turbulence of fuel and compressed air promotes complete, clean burning of the fuel. The completed pistons are fitted with five rings, four above the wrist-pin and one in the skirt. The top three are compression rings, and the lower two are special tapered, oil control rings.

A close-up view of the tooling area on a Sundstrand automatic lathe employed for turning, grooving, contour-machining of the dome, and chamfering of the Diesel engine pistons is shown in Fig. 7. In this operation, the piston is held by an air-operated expanding type chuck, and supported by the tailstock center of the lathe. Grooving is accomplished with a set of five carbide-tipped tools held in a magazine type gang tool-block, and fed into the work on the rear slide of the machine. Also mounted on the rear slide in another common tool-block, just above the grooving tools, is another set of five tools for chamfering both sides of each groove. The outside diameter of the piston is finish-turned by a single, triangular-shaped carbide tool (seen at the right on the front carriage) as it travels longitudinally toward the head of the machine.

Contour-machining of the piston dome is done in the same set-up by equipping the machine with a special overhead slide that is actuated by a cam bar. The sharp-nosed, carbide-tipped tool employed for this contour-turning operation is seen near the top center, above the dome end of the piston and the tailstock center on the lathe.

Removable cylinder heads for the new Diesel engines are stainless-steel precision castings that fit within the bores in the block and are held in place by means of a threaded plug. An unusual design feature of the engine is that the long, wet type cylinder liners are welded to the cylinder heads to make an integral one-piece assembly which is readily replaceable. This operation is performed with Linde sigma (shielded inert-gas metal-arc) welding equipment, Fig. 8.

The cylinder head is slipped on the liner (or

barrel), and the assembly clamped between hydraulically operated centers and rotated. An arc is maintained in a shield of argon gas between the filler metal electrode and the work-pieces. The coiled welding rod—No. 347 stainless-steel wire, 1/16 inch in diameter—is automatically fed by an electric motor which drives rod-feeding rolls. Sound welds having high physical properties are obtained, no flux is required, and spatter is eliminated. A 19 5/8-inch long weld pass (approximately 6 1/4 inches in diameter) requires forty-five seconds, and three passes are necessary to complete the part.

Another Sundstrand automatic lathe, Fig. 9, is employed to turn, groove, chamfer, and form fillets on the welded cylinder head and liner assembly. Four turning tools and a chamfering tool are mounted in a common holder on the front slide and fed toward the headstock of the lathe. A magazine type holder on the rear slide carries the five rough-grooving tools that are fed transversely into the work-piece. The grooves in the integral head and liner are finished by five more tools mounted on a special overhead slide and fed vertically. Also mounted on the rear slide is a tool for forming a fillet at the junction of the head and liner. All of the tools are carbide-tipped. The machining cycle is completed in two and one-half minutes.

In an unusual set-up on a Potter & Johnston automatic turret lathe, Fig. 10, the cylinder liners are both rough- and semi-finish bored to a depth of approximately 10 1/8 inches. Instead of the conventional method of mounting the tools on the turret of the machine, a boring-bar is mounted in each of the two spindles, and the work is held in special three-jaw chucks on the indexing turret. Two pairs of chucks, 180 degrees apart, are provided, so that two work-pieces can be loaded while two more are being bored. In this way, no separate loading time is required, and the only non-cutting time in the cycle is that necessary for indexing of the turret and rapid traverse to the boring-bars.

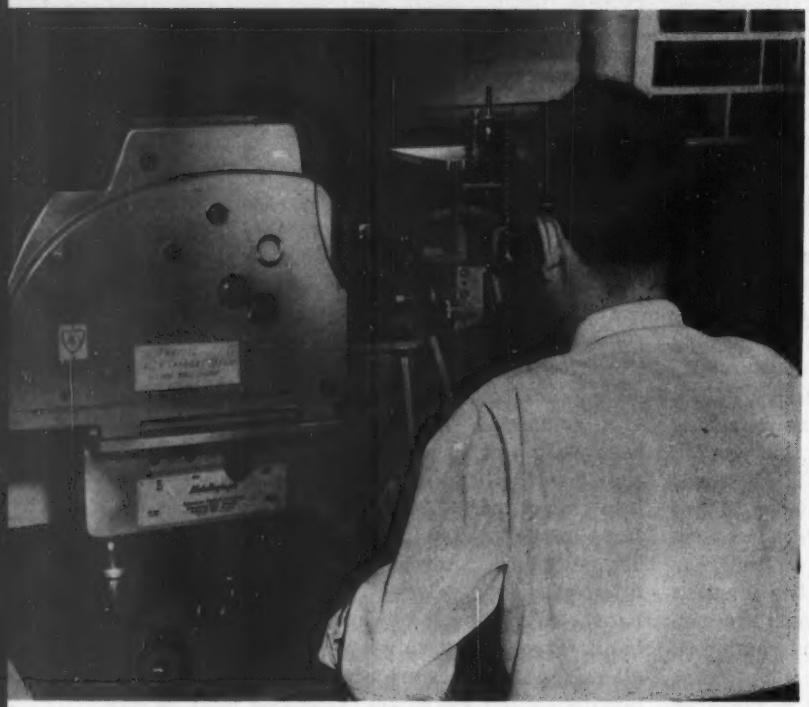
One cylinder liner is rough-bored while another is semi-finish bored, approximately 3/16 inch of stock being removed from the diameter in each operation. When boring has been completed, the turret (or work carrier) is automatically retracted, with rapid traverse, and indexed. Then, as two more parts are being bored, the previously rough-bored liner is transferred to the adjacent chuck and replaced by an unbored liner, and the semi-finish bored liner is removed and sent to the next operation. Thus, one cylinder liner is completed every six and one-half minutes.

A completely assembled cylinder liner and head with valves, piston, and connecting-rod is shown in the heading illustration being inserted into the cylinder block during assembly operations on a Packard V-12 marine Diesel engine. The standard, interchangeable cylinder head is fitted with four valves—two intake and two exhaust—driven by individual camshafts, two per bank. The exhaust valves are sodium-cooled, and all valves and seats are Stellite-faced. Spherical precombustion chambers, precision cast in the alloy-steel cylinder head, are located directly over the center of the pistons and provided with removable multiple-orifice burners which eject the hot gases directly on the domes of the pistons. A pintle type fuel injector, mounted in the cylinder head, injects metered quantities of fuel directly into the precombustion chamber, where ignition takes place and peak pressure occurs.



Fig. 10. Work-pieces are held on the turret, and boring-bars in the spindles, to permit unloading and reloading while boring operations are being performed.

Central Inspection Set-Up



Initial Parts Manufactured under Ordnance Contracts are Rigidly Inspected in a Completely Equipped Pilot Lot Laboratory at the Ordnance Ammunition Center. Parts that Meet Ordnance Drawings and Specifications are the Result.

By E. J. COTTRELL
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Joliet, Ill.

THE Ordnance Ammunition Center of the United States Army in Joliet, Ill., is responsible for the mass production of standard Army ammunition other than small arms (30 millimeters or less in size), including propellants, explosives, and chemicals. In this connection, it is necessary to supervise and maintain contact with about 1600 prime contractors of metal parts, about 6000 sub-contractors, 12 chemical works, and 11 loading and assembly plants.

Under the command of Brigadier General W. E. Laidlaw, the Ordnance Ammunition Center maintains three operating divisions: Manufacturing, Materials, and Inspection. Within the Inspection Division is the Pilot Lot Laboratory, provided for inspecting the first parts produced by any prime contractor or sub-contractor working on Ordnance contracts. Any new contractor is required to submit a sample lot containing from twenty-five to more than a hundred parts, the lot size depending upon the size of the part and its intended function. The average lot size contains seventy-five assembled and twenty-five unassembled parts. When a contractor changes in any way his manufacturing procedure or the materials used in making the product, a new sample lot is submitted.

A major function of the Pilot Lot Laboratory is to insure that the sample submitted conforms to drawings and specifications. In addition to a complete dimensional inspection, determining physical and chemical properties, and making corrosion-resistance and other tests, methods employed by the contractor in manufacturing the parts are studied for possible improvements. For example, it was found that one contractor was removing an oil-preservative coating from safety wire by degreasing prior to assembly on fuses. By eliminating the degreasing operation, corrosion resistance of the safety wire was greatly improved. In another instance, as the result of crush tests performed on sintered powdered brass rotors—a booster sub-part used with fuses for 75- to 120-millimeter artillery shells—the Laboratory recommended increased compacting pressure and a different atmosphere for the sintering furnace, resulting in a greatly improved product.

Complete inspection and testing of a sample lot involving from fifty to seventy-five different inspection or testing operations on each part requires from two to five days, with the possible exception of corrosion testing, which might require as long as 150 hours. Complete reports of the inspection and test results are submitted

Aids Ordnance Contractors

to the contractors, together with any suggested revisions in manufacturing procedure and critical points to be watched for by the resident inspector or manufacturer.

In dimensional inspection of the sample lots, from twenty to fifty dimensions of each part have to be checked. For this purpose, one room in the Pilot Lot Laboratory is equipped with numerous gaging and measuring devices such as surface plates, calipers, micrometers, vernier type height gages, feeler gages, and many other precision instruments. Fixed gages that are designed to measure only a single dimension are not used except to inspect internal threads.

Adjustable gages are preferred because they eliminate chances of error that might occur when fixed gages become worn. Then, too, it would be impractical and uneconomical to procure and keep the large number of fixed gages that would be required for the numerous different parts inspected from time to time. Even for internal threads, the use of fixed gages is sometimes avoided by dissecting the part, polishing it, and then taking the necessary measurements directly. Another method used is to pour a low melting alloy into the threaded opening. After the alloy has set, it is unscrewed and measured.

One of the many precision instruments used for dimensional inspection is the direct-reading, bench type micrometer shown in Fig. 1, called the "Supermicrometer." This accurate measuring device has a spring-loaded, constant-pressure reference anvil. With the work-piece in place, the operator's right hand is used to rotate the micrometer spindle until the dial indicator on the reference anvil reaches the zero position. Then, the spindle and thimble of the micrometer can be read in order to determine the dimension being inspected.

The enlarged thimble of the Supermicrometer can be read directly to 0.0001 inch. To make measurements of more than the 1-inch range graduated on the spindle, the reference anvil is moved outward on the tailstock. Gage-blocks accurate to 0.000010 inch at 68 degrees F. are used for setting the reference anvil at even inch increments away from the spindle nose. A maximum capacity of 10 inches is available. The work-rest table can be elevated to accommodate various size work-pieces.

Supermicrometers are particularly useful for measuring external threads, thin sheets, or gaskets. The thread on a percussion primer for 81-millimeter shells is shown being measured by means of the three-wire method, with two accurately ground wires being placed between threads on one side of the primer and the third on the opposite side.



Fig. 1. A "Supermicrometer," accurate to within 0.0001 inch, is here shown being employed to measure the thread on a shell percussion primer.

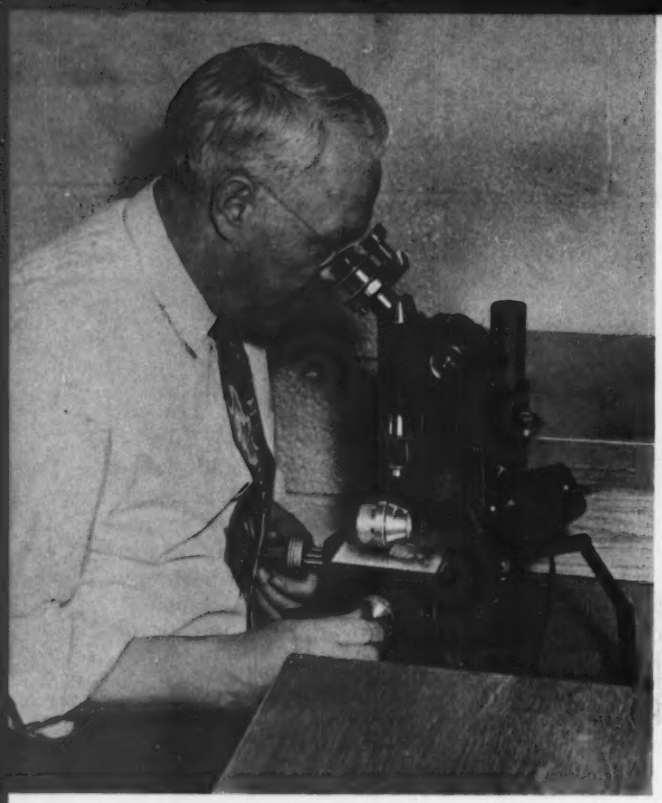


Fig. 2. Dimensions of contoured or angular surfaces, holes, and threads, and their locations, can be quickly measured on the toolmaker's microscope.

Another precision instrument which has found wide application in the Laboratory is the toolmaker's microscope seen in Fig. 2 being used to inspect an angular surface of a fuse body. The unit is especially adaptable for measuring contours, angles, holes, threads, or their locations in small parts. The microscope, which magnifies the work thirty times, can be adjusted to focus on the work-piece held on the stage or table by means of clamps, centers, or putty (as shown). Lateral or longitudinal adjustment of the stage is finely controlled by micrometer screws having thimbles reading directly to 0.0001 inch. Crosshairs viewed through the microscope and angular graduations on a transparent protractor can be aligned with angular surfaces to be inspected on the work-pieces.

Comparators are often used for similar purposes or in place of the toolmaker's microscope. On these units, as seen in Fig. 3, an enlarged shadow of the profile of the work-piece is projected on a ground glass screen. A drawing of the part showing the allowable tolerances and enlarged 10, 20, or 50 times is made on Vinylite or other transparent material. This drawing is held or clamped on the glass screen and compared with the projected image of the work-piece. On the projector shown, a magnification of 5, 10, 15, 20, 50, or 100 times size is obtained by changing the lens. The contour of a cartridge container for a 4.2-inch rocket motor is shown being inspected, with the container in a vertical position on the table, between the source of light and the lens of the projector.

Smoothness of the surface finish on various parts is determined by means of a Profilometer, Fig. 4, or Precisionaire gage, Fig. 5. The Profilometer measures the surface roughness electronically and is employed for smaller parts, and for measuring the roughness of finely finished surfaces. This precision instrument consists essentially of a tracer unit, amplifier, and dial-indicating meter. On the tracer unit in the set-up shown, a diamond point is mechanically moved over the surface to be measured. Irregularities in the surface are translated into equivalent electrical voltages, which are magnified by the amplifying unit to actuate the meter, calibrated in micro-inches, r.m.s. In this case, the surface roughness in the bore of a fuse rotor is being measured, the rotor being held in the vise seen at the right. A selector switch is provided so that the same scale can be used for various ranges of surface roughness from 1 to 1000 micro-inches. Five interchangeable tracer heads are available for measuring different size holes or surfaces.



Fig. 3. Optical inspection instrument being used to compare the projected, enlarged image of a cartridge container with an enlarged tracing of the part



Fig. 4. The bore of a fuse rotor, seen being held in a vise at the right, is measured in this Profilometer to determine the surface roughness.

The single-column Precisionaire surface gage, Fig. 5, is more of a production instrument, and is used primarily to measure rougher surfaces such as those on the peripheries of shells. Compressed air—regulated to a pressure of 10 pounds per square inch from a line pressure of 45 pounds per square inch and filtered to remove dirt, oil, and excess moisture—is supplied to the gage. The amount of back pressure created, which is controlled by the amount of air escaping from the tracing head as it is manually traversed over the surface of the shell, regulates the position of the magnesium float in the vertical air column. The scale provided alongside this vertical column is calibrated to read directly in micro-inches, and covers a range of surface roughness from 63 to 500 micro-inches.

Compression and tension springs used in many different ordnance items are tested to see that they conform with the allowable load deflection tolerances. Such tests are made on the spring checking machines shown in Fig. 6. Load is applied to the spring, which is held on the work-rest anvil, by means of a hand-lever, and the amount of loading can be read directly in pounds on the graduated dial. The amount that the spring is deflected for any given load can be read from a vertical scale mounted above the load dial. A firing pin spring for the fuse of a 57-millimeter shell is shown being inspected on the machine at the right.

The amount of looseness or play of the rotating bands on shells is determined on a special-purpose unit, Fig. 7. The shell being inspected rests in a horizontal position on an adjustable anvil, with the rotating band of the shell directly below the ram of the testing machine. An upper dial on this testing machine indicates the amount of hydraulic pressure applied to the top of a ram 6 3/4 inches in diameter. The pressure applied is controlled by a hand-lever. A dial indicating gage, mounted directly below the pressure gage, shows the amount, in thousandths of an inch, that the band is deflected when pressure is applied to force an indenter against the band.

The ram is lowered twice on each of two lo-



Fig. 5. Single-column air gage is used to determine the surface roughness, in micro-inches, of shells. A tracing head is moved over surface of the shell.

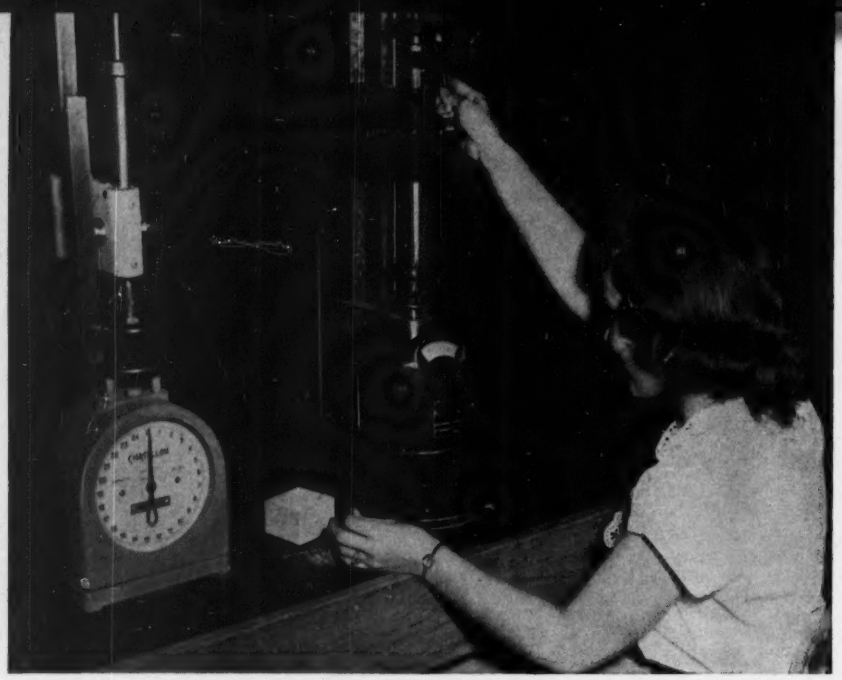


Fig. 6. Machines used for checking the load-deflection tolerances of springs. Applied load is read on dial, and deflection on vertical scale.

cations on the rotating band at pressures between 10,000 and 11,000 pounds. The difference in readings taken from the dial indicating gage at each pressure is an indication of the looseness with which the rotating bands are seated on the shells. An average is taken of the reading differences obtained at the two different locations on the band. Shells varying from 75 to 155 millimeters can be handled on the one machine simply by changing the indenter and raising or lowering the work-rest anvil.

A most useful instrument for determining the hardness in the necks of shells or cartridge cases is a portable hardness tester. Pressure is applied to the penetrators by screw action, and the hardness of the part being inspected is read directly from A, B, or C Rockwell hardness scales. These graduated scales are engraved on dials mounted on the barrel of the tester, directly beneath a Lucite magnifier to facilitate reading. The tester is equipped with reversible and special anvils to accommodate various shaped parts, diamond penetrators for testing the hardness of hardened steel, and ball penetrators for softer materials.

Physical properties of the materials used in ordnance items are quickly determined on the hydraulic testing machine shown in Fig. 8. Tension, compression, transverse, and flexure testing of the sample are possible to determine the tensile strength, yield strength, per cent elongation, compressive strength, etc., of the material. The testing machine is frequently used for tensile testing of shell rotating bands both before and after assembly on the shell. Assembled bands are cut with a chisel, bent off the shell, flattened, and sawed to the shape of a standard tensile specimen before testing.

Rotating bands for the 105-millimeter shell, made from a high-copper red brass (gilding metal) containing from 90 to 97 per cent copper and the remainder zinc, must have a maximum tensile strength of 40,000 pounds per square inch before assembly on the shell, and a minimum tensile strength of 32,000 pounds per square inch after assembly. This machine is also used frequently for crush testing of rotors, detonator cups, firing pin supports, etc.

The tensile testing machine has a maximum load capacity of 60,000 pounds, and the rate of loading or testing speed is variable from 0 to 2 inches per minute. While the 28-inch diameter dial reads directly in pounds, it is a simple matter to convert the results to pounds per square inch since the cross-sectional area of the test sample is standard. The dial is graduated for three testing ranges: the full capacity range graduated from 0 to 60,000 pounds in 5000-pound increments, the one-fifth range from 0 to 12,000 in 1000-pound increments, and the one-fiftieth scale from 0 to 1200 in 100-pound increments. Lines engraved between the numbers on the dial make it possible to read to the closest 2 pounds when using the 1200-pound scale. The machine is calibrated periodically by means of a master proving ring.

Fluorescent penetrant inspection methods play an important part in operations performed at the Pilot Lot Laboratory. Part of a cartridge container fin for 81-millimeter mortar shells is shown being inspected in Fig. 9 by the Magnaglo process. The tubular part is placed over a copper bar clamped between the head and the tailstock of the Magnaflux unit, and magnetized. A light oil containing fluorescent penetrant particles is flowed over the magnetized part. The particles are attracted to surface cracks or

defects and glow when exposed to "black light." ("Black light" is the popular term used to describe the "near ultraviolet" rays just beyond the visible spectrum.)

Microscopic studies of polished metal specimens, to determine their grain size or structure, are possible with the desk style Metallograph shown in the heading illustration. Magnifications of 75, 100, 500, or 1000 times size can be selected at will, and 5- by 7-inch photographs of the grain structure can be made at any magnification. Final focussing for photographic purposes is accomplished automatically while examining the specimen through the visual system. Rotating bands for shells have critical grain size requirements, and polished specimens are examined on this precision instrument.

Corrosion resistance of plated, painted, or other finished surfaces on ordnance parts is tested in a salt-spray cabinet. A predetermined rate of condensation and concentration of the salt water fog and solution is maintained in the cabinet, and the samples are suspended from bars, Fig. 10. Saturated air at a pressure of 15 pounds per square inch is blown across the nozzle from which the salt solution (sodium chloride

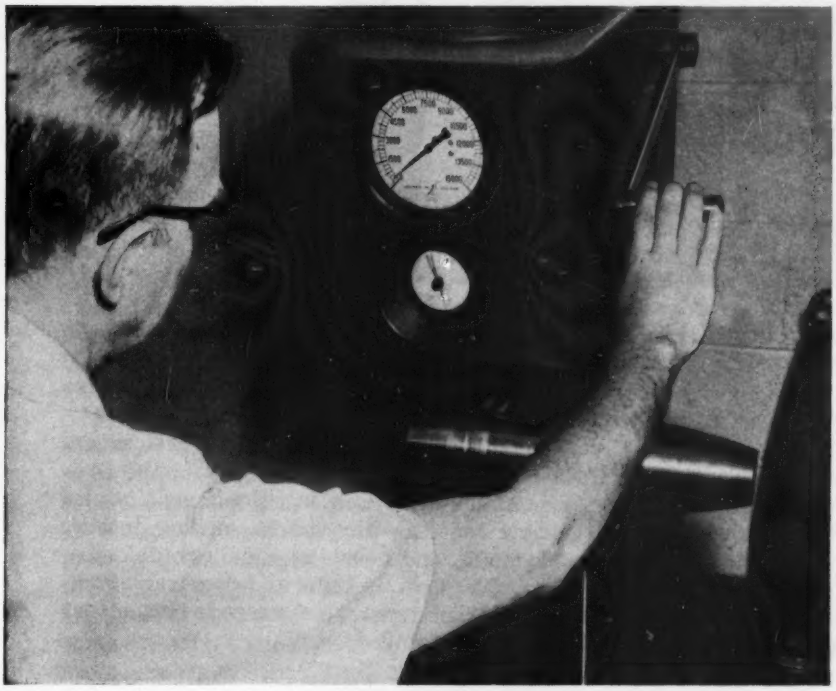


Fig. 7. Amount of looseness with which rotating bands are seated on shells is determined on this machine. Hydraulic pressure forces an indenter against band.

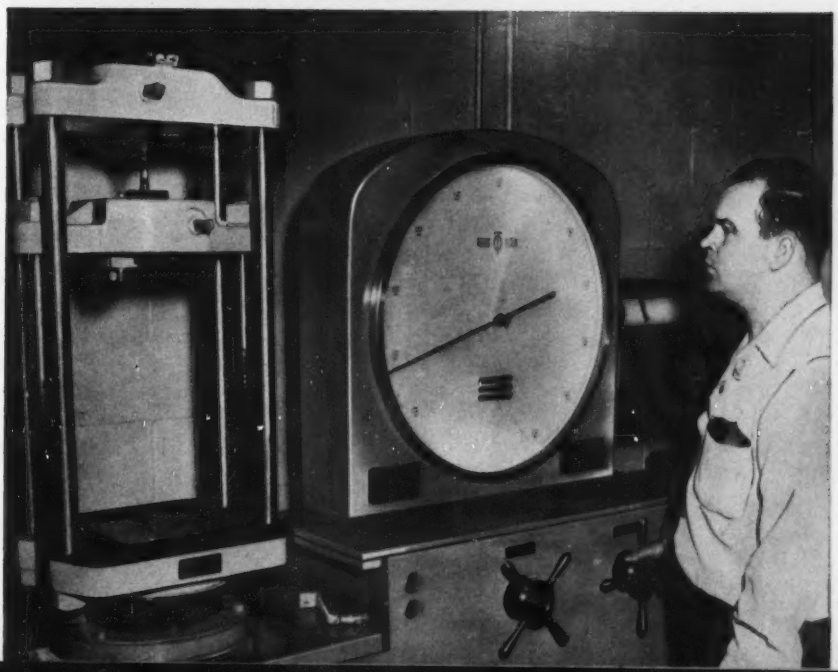


Fig. 8. Tensile strength of a material used for the rotating band of a shell is being determined on this hydraulic testing machine.

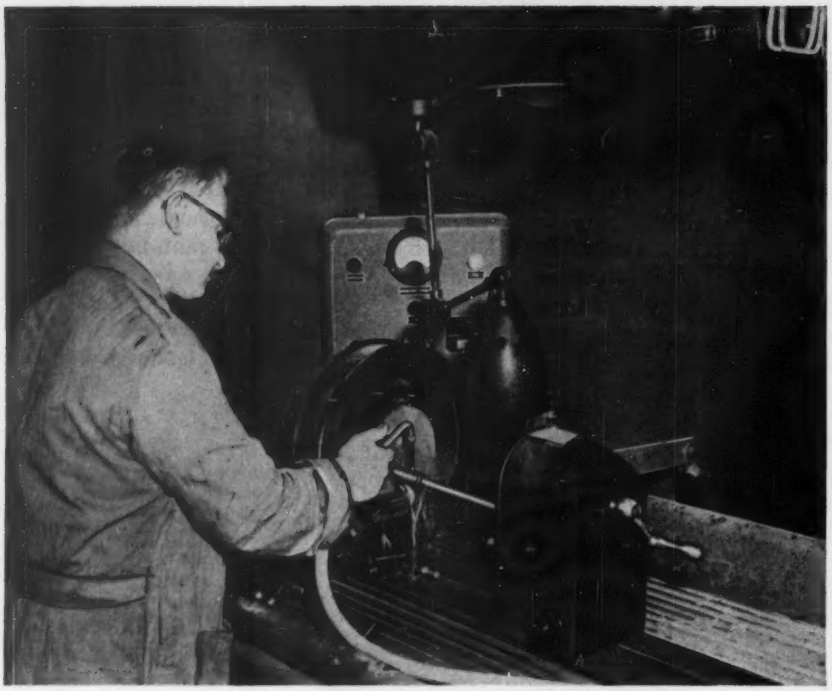


Fig. 9. A magnetized part is flooded with oil containing fluorescent penetrant particles which are attracted to surface defects and glow under "black light."

dissolved in distilled water) enters the tank. The cabinet is vented at all times so that no pressure is built up. Temperature of the distilled water is not allowed to exceed 110 degrees F., while the temperature inside the cabinet is maintained between 90 and 95 degrees F. Specific gravity of the salt solution is held from 1.127 to 1.154.

The length of time required for corrosion testing varies from 6 to 300 hours, depending on the design of the part and the type of finish being tested. For plated finishes, a 24- to 48-hour test is employed, while painted surfaces are generally subjected to a 150-hour test. It has been estimated that 24 hours in the salt-spray cabinet is approximately the same as five years of "weathering" in service.

Many other precision inspection devices are in use at the Pilot Lot Laboratory of the Ordnance Ammunition Center. Equipment is also available for dissecting parts, making tensile-test samples, and polishing metallographic specimens. Complete electrical and chemical laboratories and spectrographic analysis equipment will soon be installed.



Fig. 10. Examining ordnance parts that have just been removed, after 150 hours, from salt-spray, corrosion-resistance testing cabinet

The Application of Postformed Thermosetting Laminates

Postformed Laminated Plastics Should be Selected for Various Applications on the Basis of Such Considerations as Quantity of Parts to be Made, Complexity of Shape, Physical Properties Required, and Type of Service in which Part is to be Used. The Eighth and Final of a Series, This Article Describes Some Typical Applications.

By WILLIAM I. BEACH, Executive Assistant
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THE application of materials formed and shaped by the postforming process has grown slowly and steadily. During the war, laminated plastic materials were substituted by the aircraft industry for some of the more strategic materials, such as aluminum alloy. Consideration was originally given to the laminates primarily because of their lightness. However, when postforming developed to the point where some of the other useful properties of these materials could be employed to better advantage, engineers began to regard the laminates in the light of more permanent use instead of merely as a substitute for critical materials. Subsequently, postformed parts were incorporated in many types of military aircraft.

Since the war this trend toward postforming has also been active in commercial and industrial fields. It is to be expected that here the progress of postforming would be less conspicuous because of the merchandising advantages held by well established manufacturing processes. In the competitive market, price is the criterion, and the inherent properties of postformed materials which offer much to the aircraft manufacturer are subordinated by comparative cost evaluation. The higher cost of postforming materials compared to aluminum, steel, wood, and other fabricating materials is somewhat of a competitive handicap when retail prices are considered the only factor of importance. However, some industries have problems dealing with cor-

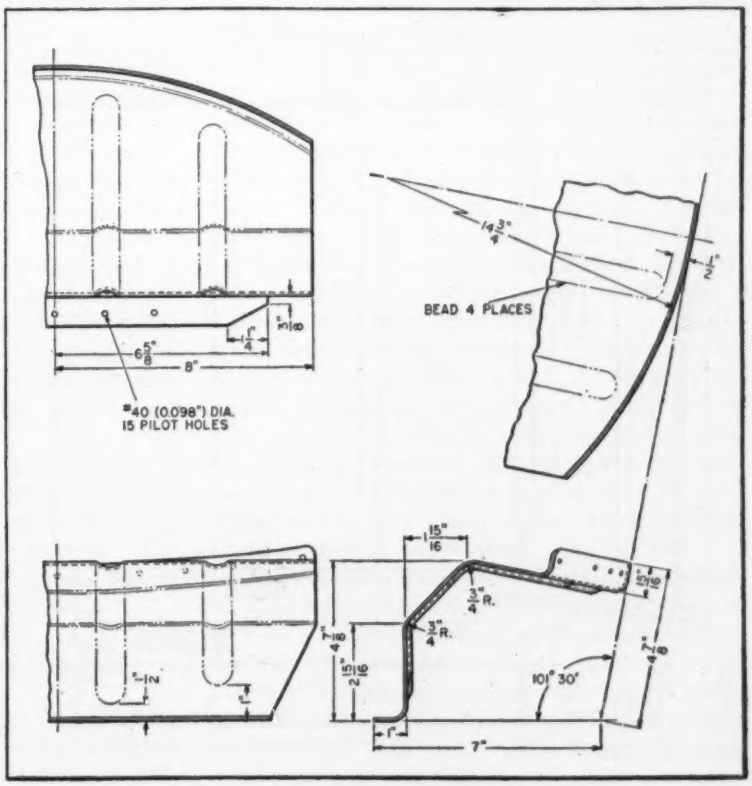


Fig. 1. Thermosetting laminated plastic is used to make this pilot's ejection type seat cushion because of its light weight.

Note: The Postforming Process is covered by United States and foreign patents, and pending applications are assigned to North American Aviation, Inc.

rosion, abrasion, vibration, insulation, and the like, where utility more than unit cost must be considered. Here postforming materials perform well and, with proper selection of application, can be employed to best advantage.

Frequently, careless applications of plastics have created unfavorable reactions tending to close the engineer's mind to the possibilities offered by such materials for fabrication. In some instances such an attitude is justifiable in view of the fact that plastics have far too often been selected for structural purposes, failing because they should never have been selected in the first place.

Plastics as a whole, and particularly the laminated thermosetting types, seldom compare well with metals where high strength, toughness, and subjection to exceptionally rough abuses form a part or all of the basic requirements of the product. The foregoing is not to be construed as a bar to the use of these materials in structural work, but is intended to point out that when consideration is based upon comparative physical properties the laminates are at a very definite disadvantage.

On the other hand, laminated materials have certain properties which are equal to or better than other materials. The laminates are lighter than metal in the order of one-half the weight of aluminum and approximately one-fifth that of steel. They have a degree of resiliency not obtainable with metals and therefore resist permanent deformation in the form of dents, depressions, and the like. Comparing other useful properties, the laminates possess exceptionally good abrasion-resisting characteristics which excel over most fabricating materials. Resistance to corrosive elements is another property of this material recommending its preferential use in applications exposed to acid fumes, salt air, and high humidity. Another property of the laminates is their ability to provide insulation for electrical and thermal applications.

The postforming process may be carried out quickly and easily, using relatively simple equipment and, in many instances, unskilled labor, thus producing parts cheaply. From a manufacturing standpoint, costs of postformed parts, particularly with respect to objects of complicated shape, are often considerably lower than a comparable metal part. This is primarily due to the fact that fully thermoset laminates have a very limited range of residual plasticity and, when brought to their softening temperature, must be formed immediately and in one continuous operation, whereas many complex parts formed from metal entail a number of additional operations in order to obtain the formed product.

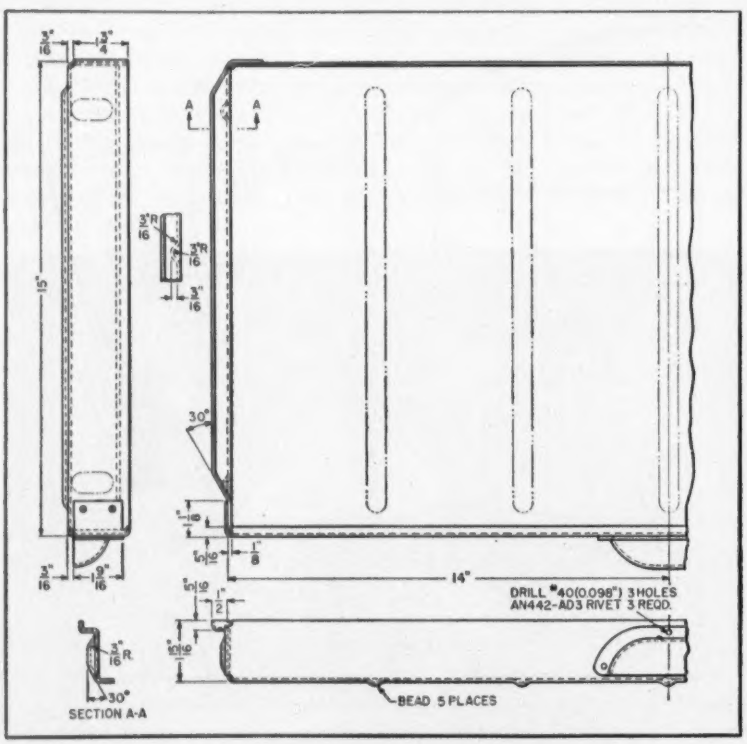


Fig. 2. This lightweight navigator's chart table-drawer assembly is also made of thermosetting laminated plastic.

In instances such as this, lower operation cost is an asset to postforming. On the other hand, this advantage may be shadowed by higher material costs, and in the event production man-hours represent only a small percentage of the total cost, the postformed part may be priced out of the competitive market. Therefore, to offset higher material costs, it is advisable to select logical applications on the following basis:

1. Limited production runs or prototype work.

Labor and tooling are normally major factors of cost in these cases. The use of inexpensive tools and equipment is an asset to postforming.

2. High labor cost items, preferably of complex form.

These parts lend themselves to simple postforming procedures which utilize

fewer production man-hours and therefore tend to compensate for the higher material cost. Avoid parts of simple form which can be stamped from metal, or shaped in single-action metal-working dies.

3. Utility application, which demands the best serviceability properties of a material.

This field offers wider possibilities for greater and more permanent utilization of postforming materials.

These points are illustrated by specific applications in connection with the manufacture of aircraft. An airplane is a highly specialized machine assembled from many thousands of components made up of structural, semi-structural, and non-structural members. Structural members are designed to support flight and landing loads. The proper performance of these members determines the usefulness of the airplane. Semi-structural members are those parts which are not necessarily responsible for the safety of the airplane if they fail.

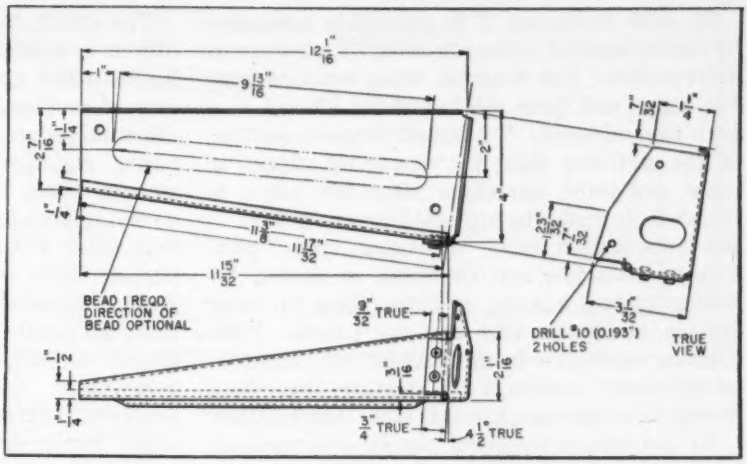


Fig. 3. To resist permanent deformation resulting from normal abuses, the center latch cable guard of this aircraft door is made of laminated plastic.

Non-structural items are sometimes looked upon as necessary evils. They consist of such utility parts as fixed equipment supports and guards, ammunition containers and chutes, deflector plates, and various other items needed for service requirements. Accordingly, it has been ascertained that the most useful field for postformed plastics lies in non-structural and, in some instances, semi-structural parts. Typical examples of some of these uses are shown in the accompanying illustrations. For such applications, these parts have several advantages other than the paramount one of being lighter than parts made of metal.

Although the following examples pertain to typical aircraft parts, the applications are not necessarily limited to this field alone, but suggest similar uses in other fields as well. The parts were selected according to their primary function, and are classified as follows:

1. Weight reduction
2. Resistance to permanent deformation
3. Resistance to abrasion
4. Electrical insulation

The saving of weight is frequently a matter of great concern to manufacturers when the efficiency and performance of a particular machine or structure depend upon specific weight requirements. Once production has started, if the total weight exceeds the allowable maximum, it is not always easy to reduce the weight because of practical considerations and economic factors. Hence, the designer must give proper attention to material selection in the preliminary stages of design. In the manufacture of aircraft, weight control is an essential requirement. Aluminum alloy, because of its low weight to strength ratio, is deemed the acme of fabricating materials. The airframe is constructed almost entirely of this material. Steel is employed in high load-carrying members such as landing-gear struts, engine mounts, brackets, and other stressed fittings. Certain parts of the airplane are not designed to carry structural loads. These can be fabricated from any lightweight material suitable under normal operating conditions.

Postformed parts designed to save weight include panels, covers, access doors, and various types of supports. Figs. 1 and 2 illustrate postformed parts which are employed in aircraft to save weight. Aluminum could have been used for these parts except that when this material is reduced in thickness on an equal weight basis it becomes so thin that the fabrication of these parts is usually impractical.

When deformed beyond the elastic limit, metals take a permanent set. Occasionally, the latitude of a design permits a small amount of permanent set, such as in depressions and other forms of deformation caused from impact loads, providing the part continues to function or does not interfere with other parts. Normally engineers prefer an extra margin of safety whenever possible, and take steps to prevent the loss of shape of a part under operating conditions.

In some instances, it is absolutely necessary to insure against causes leading to permanent deformation. For example, when machine guns fire, cases and links are forcefully ejected at a high rate of speed. To protect exposed sections of the airframe from the damaging impact of cases and links, necessary steps are taken to direct their paths to protected areas, located in the ammunition bays. In these areas, postformed materials are employed as liners, deflector plates, guards, and the like, to cover frames, bulkheads, ribs, and side panels. Postforming material—being resilient and therefore exceptionally resistant to denting—has been found to be serviceable for these applications.

In addition, postformed panels, consoles, and various guards, are employed in the fuselage to protect instruments and items of fixed equipment from passenger or pilot abuse. A typical postformed part representative of this class is shown in Fig. 3.

The ability to wear well under abrading conditions is another attribute of postforming materials which goes hand in hand with the property of resiliency. It is commonly known that other materials, such as stainless steel, possess better resistance to abrasion under circumstances where the working surface is well supported to prevent deflection. But it is also known that when a metal panel is inadequately supported, there is some tendency to deflect and yield if subjected to accelerated glancing forces until the panel may convert from a sliding to an impact surface, whereupon scarring or scuffing takes place. On the other hand, the elastic recovery of postformed material enables it to withstand the impact of glancing blows considerably better.

This feature is important in the design of ammunition feed and ejection chutes. These parts are needed to guide ammunition belts to the guns and to receive and direct ejected cases and links after the guns are fired. It is therefore essential that the parts work smoothly and maintain their shapes in order to prevent jamming of the guns, and also to stop flying cases from damaging other portions of the airplane.

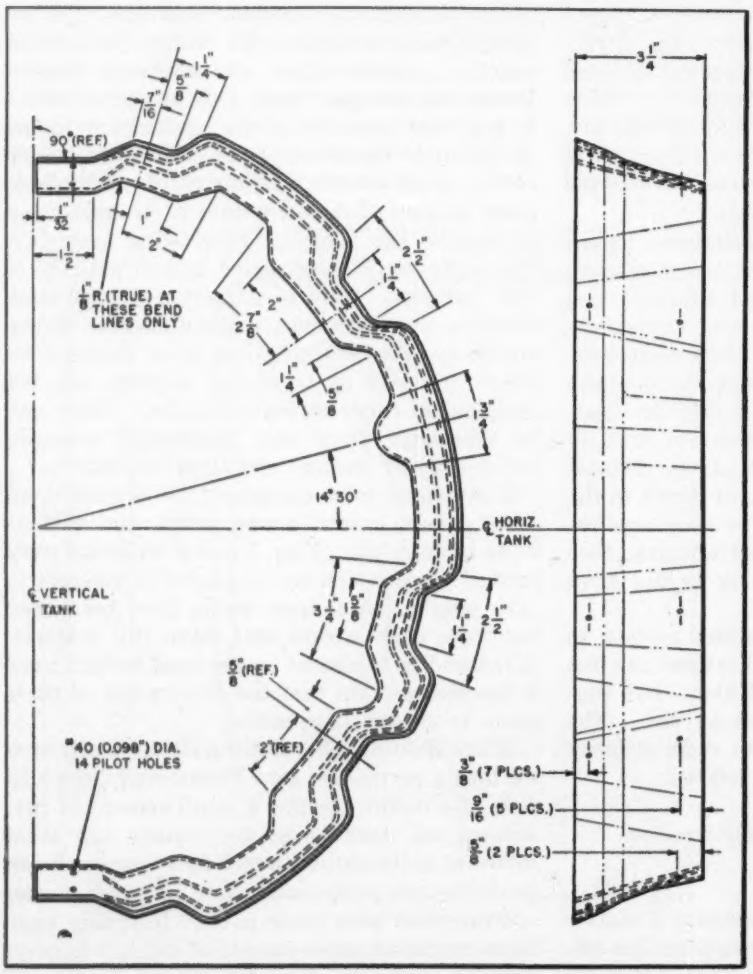


Fig. 4. A wing-tip drop-tank liner made of thermosetting laminated plastic makes use of the abrasion resistance of this material.

Beside aircraft armament items, other parts utilize the resilient property of these materials to resist abrasion. Postformed fair-leads are quite common and are considered standard parts. Postformed floor panels around the pilot rudder pedals hold up much better than corresponding aluminum parts. These and many other parts are now in useful service throughout airplanes. Fig. 4 illustrates a liner for a wing-tip drop tank made of this material.

One of the better known properties of these versatile materials is their high dielectric strength. For electrical insulating purposes such material has long been used in applications limited to flat areas. Now, however, that dielectrical material can be formed, it is used in many other different ways. The

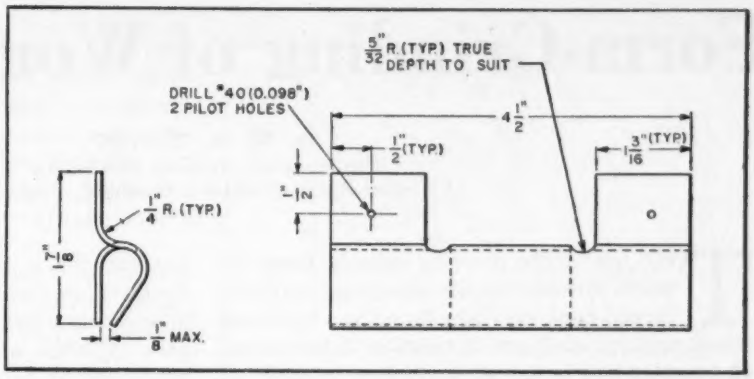


Fig. 5. The high dielectric strength of thermosetting laminates is applied in such aircraft parts as this outer wing electric wire harness guard.

outer wing electric wire harness guard shown in Fig. 5 is typical of the parts that make use of this property of laminated plastics. In many respects electrical applications for postformed materials have hardly begun, and possibilities are daily offered to electrical engineers in the creation of new designs involving insulation along with integral construction and installation.

The excellent anti-corrosive and vibration damping properties of these materials lend themselves to many useful applications. Such items as battery box containers, acid tank liners, ventilating ducts, and cooling tower blades are a few of the applications that can be made of this material in oil-refining and chemical plants. An equal number of applications might be proposed for the prevention of vibration fatigue whenever that troublesome problem confronts the engineer.

The foregoing covers, in general, selective postformed applications for aircraft. In a relatively short span of about five years these materials have undergone rigorous tests and have proved to be reliable for substantially all conceivable service conditions in temperate, cold, and hot humid regions. One of the current military jet fighters has in it 113 postformed parts, the total weight of which is 229 pounds. Expressed in terms of gross weight of the airframe—that is, the bare frame minus the weight of the engine, fuel, ammunition, etc.—this amounts to approximately 3.5 per cent.

* * *

Carboloy Customer Training School

Six hundred classes have now been completed in the Carboloy Customer Training School, Detroit, Mich., which was started eleven years ago for the purpose of instructing customers in the application of carbides. More than 5400 men and women in supervisory positions from about 1400 companies have taken the five-day course. They came from forty states and thirteen foreign countries.

Comment on Comparator Gage for Internal Measurements

By I. A. HUNT
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In the September issue of MACHINERY, pages 204 and 205, L. S. Santer described a comparator gage for internal measurements. Although the mechanism of this gage is an interesting application of the Scott Russell straight-line motion, the gage itself should not be considered a good one because it is cumbersome and inaccurate. Besides, the gage would be costly to make, and moving parts would develop considerable friction and inertia.

For any dial indicator to be sensitive and accurate, friction and inertia must be reduced to a minimum. On the gage shown in Figs. 2 and 3 (September), the indicator point slides back and forth on bracket *c*, thus creating friction and tending to bind the indicator spindle against its bearings. Also, measuring point *C* of the gage reciprocates on the surface of the work-piece.

Further friction is caused by pin *A* sliding in slot *b*, and the fulcrum pin extension *B* (from which the dial indicator is suspended) reciprocating in slot *d*. Then, too, there is friction between the vertical posts around which springs *f* are mounted and the mating bores in the base of the gage. Other sources of error are in the fits between the rotating and sliding members.

There are standard caliper type indicating gages available on the market for this purpose which are lighter and easier to use, and have less friction. Such gages can be equipped with odd-shaped arms of various length to suit different requirements. Even these gages, however, may not always be extremely accurate because skill is required on the part of the inspector to insure that the minimum distance between the surfaces being gaged is read. A slight "rocking" of the gage is required to position the contact points directly opposite one another.

Form-Grinding of Worm Threads

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THE use of the involute helicoid form for worm threads has the advantage that each thread flank may be ground by a flat-faced wheel appropriately set in relation to the worm. In practice this is not accomplished as easily as might be expected, but the principle is sound and the grinding of involute helicoid worm threads by flat-faced abrasive wheels has been regular commercial procedure for many years.

The disadvantage of this procedure, however, is that a single wheel can grind only one thread flank at a time, whereas in grinding screw threads it is common practice to grind the flanks in at least two places at once. A grinding wheel that grinds two flanks simultaneously must be symmetrically placed in relation to them. It is not possible for a flat-faced wheel to grind both flanks of an involute helicoid worm thread simultaneously unless the wheel cuts deeply into the base cylinder, and a worm with root cylinder small enough to permit this is an objectionably weak one with a large proportion of useless thread flank (see Fig. 1). Consequently, two-flank grinding of worm threads has meant a departure from the simplest possible type of wheel and the substitution of one which must be dressed to an axial section that is not, in general, of straight-line form.

For a worm of small lead angle (which usually means a single-thread worm), the form of the axial section of the grinding wheel almost exactly fits the form of the normal section of thread space of the worm. Where the lead angle is not small, however, the wheel must be dressed to a curved profile different from the normal section of the thread. The rigorous method of calculating the form of a wheel that is to grind involute helicoid threads is known, but the process is a laborious one absorbing a great deal of time. A simpler alternative has been sought.

It is fairly certain that no mathematically exact procedure can be any simpler than the conventional one, so the search has been for a method that gives adequate accuracy with simple calculation. The first advance was made when it was realized that most grinding wheels accurately dressed for dealing with involute helicoid worms had but slight curvature on the working flanks. Any line that is slightly curved in one direction only, approximates a circular arc. The problem then became one of determining the position of the center and the length of the radius of the circular arc which most closely approximates the profile of this ideal wheel.

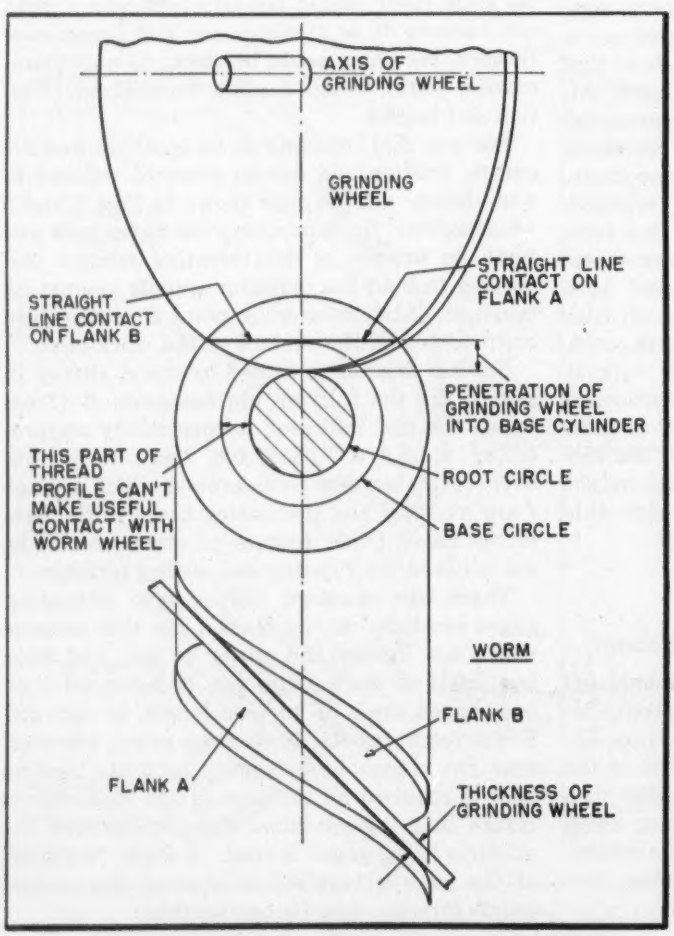


Fig. 1. Diagrams showing the impracticability of the simultaneous grinding of two flanks of a worm thread using a flat-faced wheel

The fact that there is a minute difference between the theoretically correct section of the grinding wheel and a circular arc is not serious because (1) a curved form dressed by a diamond does not always exactly coincide with the path of the diamond; and (2) a curved form finished by a grinding wheel does not always exactly coincide with the form of the wheel.

For these reasons, some measure of adjustability is essential in any device used to dress a grinding wheel in such a way that it produces a predetermined form in the worm thread. It was realized that such adjustability might also be used to correct any slight errors due to the fact that the ideal profile is not exactly of circular-arc form, and also due to the imperfection in the method of calculating the radius of the most closely approximating circular arc.

Fig. 3 represents the section of a thread space cut by a plane that is normal to the thread of an involute helicoid worm. The plane contains three points, *P*, *A*, and *A'*. Point *P* is on a cylinder of radius r_m (the mean of the tip radius r_t and the root radius r_r) concentric with the axis of the worm, and is symmetrically placed in relation to the adjacent thread flanks. Points *A* and *A'* are the feet of the perpendiculars from *P* onto the flanks, and are therefore the points of contact between the flanks and an imaginary rack tooth *DEFG* whose normal sections are parallel to the plane of the aforementioned section which is the plane of the paper. The axis of the grinding wheel under consideration also lies in this plane and is parallel to *PX*.

By regarding *PX* as the trace of the pitch plane of engagement of rack and worm, it can be shown that the length of the straight line *PC* is equal to the length of the arc *PB*.

The worm-thread flank touches each rack-tooth flank along a straight line inclined to the tip; the projection of this line in the plane of the paper is represented by *DE* for the left flank and *GF* for the right flank. The profile of a grinding wheel that touches the left flank of the worm thread cannot lie to the right of *DE*, and obviously it cannot lie to the left of worm-thread flank *KH*. The normal to the worm-thread flank at *A* is *AP* which lies in the plane of the paper. It intersects the axis of the grinding wheel, and is therefore normal to the profile of the grinding wheel. Hence *A* is a point of contact between the grinding wheel and the worm thread. Thus the profile of the grinding wheel in the plane of the paper approximates a circular arc whose center must lie on the normal *AL* at a distance from *A* exceeding the radius of the thread profile *KH* at *A*.

If the grinding wheel were of infinite radius, its profile would be that of the rack, and the left-hand profile of the worm-thread flank would coincide with the straight line *DE*. This corresponds to an infinite value of *AL*.

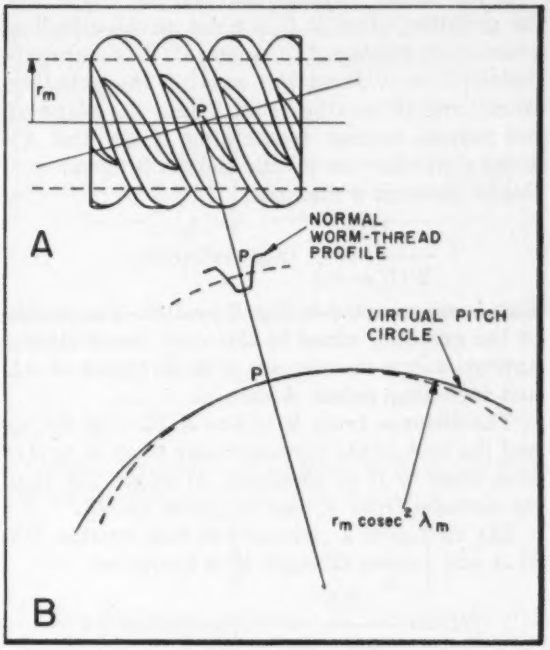


Fig. 2. (A) A portion of an involute helicoid worm showing the normal worm-thread profile. (B) The intersection of the normal plane and a cylinder of radius (r_m) is an ellipse.

If, on the other hand, the grinding wheel were of exceedingly small diameter, its line of contact with the left-hand profile of the worm-thread flank would closely approximate *KH*, and the corresponding radius would be that of the normal section *KH* of the thread.

Contact between the worm thread and the rack-tooth flank is in the plane that touches the base cylinder and lies perpendicular to the plane of the rack-tooth flank. This plane intersects the plane of the paper in *PL* and also the plane of the rack-tooth flank in a straight line *AZ* inclined to the top edge of the rack tooth at an angle *T* defined by

$$\tan T = \cot \lambda_m \sin \phi_n$$

where λ_m is the lead angle of the worm at radius r_m and ϕ_n is the normal pressure angle at radius r_m.

The flank of an infinitely large grinding wheel would coincide with that of a rack tooth, and therefore the worm thread would touch the wheel in that same line *AZ*. The straight line *AZ* reaches the tip of the worm thread at *Z* whose position is determined by the relation

$$DZ = DA \cot T = DA \tan \lambda_m \operatorname{cosec} \phi_n$$

If the center distance between the worm and the grinding wheel is U, a point on the grinding wheel that touches the worm at Z is approximately $U - r_t$ from the axis of the grinding wheel, and in moving from Z into the plane of the normal section (containing K, D, and A) along a circular arc of this radius, it moves vertically through a distance

$$\frac{DZ^2}{2\,(U - r_t)} \text{ (approximately)}$$

This is represented in Fig. 3 by DM. The profile of the grinding wheel in this case would closely approximate a circular arc with its center on AL and including points A and M.

The distance from M to line AD is $DM \sin \phi_n$, and the foot of the perpendicular from M to AD is so close to D as compared to length DA that its distance from A may be taken as DA.

The radius of a circular arc that touches DA at A and passes through M is therefore

$$R_1 = \frac{DA^2}{2DM \sin \phi_n} \text{ (approximately)}$$

Substituting for DM and then for DZ, this expression becomes

$$R_1 = \frac{DA^2\,(U - r_t)}{DZ^2 \sin \phi_n}$$

$$= (U - r_t) \cot^2 \lambda_m \sin \phi_n \quad (1)$$

If $(U - r_t)$ is infinite, then R_1 is infinite. This is borne out by the fact that the wheel profile is straight. If, on the other hand, $(U - r_t)$ is made small, Equation (1) leads to a small value for R_1, whereas it can never be less than the radius of curvature, say R_2, of the normal section of the thread profile. It was suggested, therefore, that the radius R_w of curvature of the wheel profile might be expressed as

$$R_w = kR_1 + R_2 \quad (2)$$

where k is a constant depending on other dimensions of the worm and grinding wheel.

This formula is correct for certain extreme cases:

1. If U is infinite, the grinding wheel corresponds to a rack with a straight-sided profile. Formula (1) agrees with this because it shows R_w infinite when R_1 is infinite.

2. A grinding wheel of the minimum possible diameter would touch the worm thread along a profile corresponding almost exactly with the profile of the worm thread in the normal section which contains the axis of the wheel, and so the radius of the profile of the wheel would be the radius of the profile of the worm thread in the normal section. This means that R_w is equal to R_2 in Formula (2) if $R_1 = 0$.

3. If the lead angle of the worm is exceedingly small, the normal section of the thread is straight-sided, so that R_2 is infinite. Furthermore, owing to the fact that there is only a minute helical twist on the thread, the grinding wheel is straight-sided. The formula agrees with this by showing R_w infinite when R_2 is infinite.

The section of the cylinder of radius r_m in the plane of the paper is an ellipse, and the radius of curvature of the ellipse in the vicinity of P is $r_m \operatorname{cosec}^2 \lambda_m$ (see Fig. 2, *A* and *B*). It may be shown that the radius of curvature of the normal section of the thread at radius r_m is the same as that of an involute where it intersects a circle of radius $r_m \operatorname{cosec}^2 \lambda_m$ at a pressure angle equal to the normal pressure angle ϕ_n of the thread.

Hence, the radius of curvature of the normal thread profile R_2 is

$$R_2 = r_m \operatorname{cosec}^2 \lambda_m \sin \phi_n \quad (3)$$

The radius of curvature of the normal section at A is equal to R_2 minus the amount AP, but in examining the results of using this approximate method of determining the radius of grinding wheel profiles, it was found that this refinement gave no advantage. It was found, moreover, that the value $k = 1$ produced good approximations to accurately calculated wheel profiles, but that some improvement could be effected by making k equal to one-sixth of the difference (in degrees) between the lead angle at the mid-depth of the thread and the lead angle at the tip. In this way, Equation (2) becomes

$$R_w = \frac{\sin \phi_n}{\sin^2 \lambda_m} \left[\frac{(\lambda_m - \lambda_t)^\circ}{6} (U - r_t) \cos^2 \lambda_m + r_m \right] \quad (4)$$

where

λ_t = lead angle at tip of worm thread.

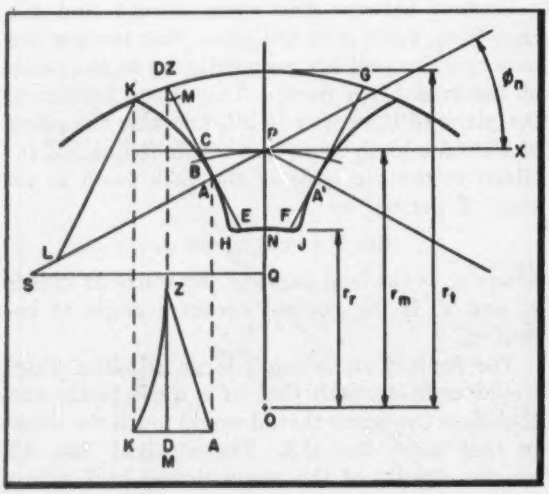
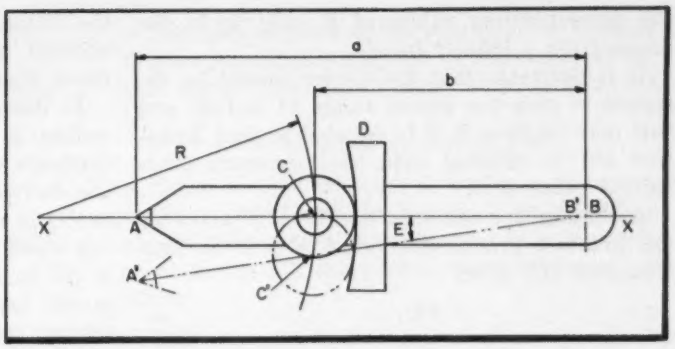


Fig. 3. An enlarged view of the normal worm-thread profile seen in Fig. 2 (A).

Fig. 4. A dressing device for grinding wheels. Diamond (A) at left end of bar is capable of dressing surfaces of curvature whose radii range from about 1 1/2 inches to those approaching infinity.



It may be added that in studying this subject in detail an examination was made of many geometrical approximations that superficially were more accurate than Formula (4) but none was found to have general superiority to it.

Wheel-Dressing Device for Grinding Radii from 1.5 Inches to Almost Infinity

One advantage of having a circular-arc profile on a grinding wheel is that the dressing device may simply be a diamond set in the end of an adjustable arm which swings about a fixed pivot. A difficulty arises, however, if the radius of the required profile is greater than 10 inches, for then the length of the swinging arm and of the extension that supports the pivot make the device cumbersome. Fig. 4 shows the kinematic arrangement of a device which, with convenient dimensions, enables the radius of the path of the diamond to be given any value between about 1.5 inches and infinity.

Diamond A is mounted on one end of a bar whose other end is constrained to move on line XX. An intermediate point C on the bar is constrained to move in a circular arc of radius R whose center is on XX by contact of a fixed circular arc segment D with a roller on a pin centered at C. The roller is spring-loaded in some manner to keep it in contact with segment D. The length of BC and the position of D are adjustable, and this makes it possible to give the path of the diamond the desired radius.

Let AB be moved to the position $A'B'$ (shown dotted) making an angle E with XX. Then

$$AA' = a \sin E \text{ (very nearly) and}$$
$$CC' = b \sin E \text{ (very nearly)}$$

The horizontal displacement of C' to the left of the vertical through C is therefore

$$\frac{(b \sin E)^2}{2R} \text{ (very nearly)}$$

and similarly, the horizontal displacement of A to the right, relative to C, is

$$\frac{[(a - b) \sin E]^2}{2 (a - b)} \text{ (very nearly)}$$

The horizontal displacement of A' to the right of the vertical through A, is therefore

$$\frac{\sin^2 E}{2} \left[(a - b) - \frac{b^2}{R} \right]$$

The radius of curvature of the path of A in moving to A' is therefore, very nearly,

$$R_a = \frac{(AA')^2}{2 \times \text{horizontal displacement of } A}$$

$$= \frac{(a \sin E)^2}{\frac{2 \sin^2 E}{2} \left[(a - b) - \frac{b^2}{R} \right]}$$

$$= \frac{a^2}{(a - b) - \frac{b^2}{R}} \qquad (5)$$

This radius of curvature is considered positive if the center of curvature is to the right of A. In dressing wheels for grinding involute helicoid threads, this radius of curvature must be positive. An examination of the preceding formula reveals that if $b = a$ then $R_a = -R$. This can be shown to be true physically since the path of A is determined entirely by the segment, and not at all by the obliquity of AB. If b is varied so as to take on values in the range between $b = a$ and $b = k$, where k is the value of b satisfying the equation

$$\frac{a^2}{(a - b) - \frac{b^2}{R}} = 0 \qquad (6)$$

then the corresponding values of R_a will lie in the range from $-R$ to $-$infinity. If b is assigned values in the range between $b = k$ and $b = 0$,

the corresponding values of R_d will lie in the range from +infinity to a.

It is desirable that the device should be designed to give the widest range of radius, and this may be done if R is selected so that Equation (6) is satisfied with the maximum practicable value of b.

Assuming, for example, that $a = 10$ and that the greatest practicable value of b is 8, then Equation (6) gives

$$2 - \frac{64}{R} = 0, \text{ or}$$

$$R = 32$$

On this basis, and assuming that the minimum practicable value of b is 1.5, the minimum positive attainable value of R_d is

$$\frac{10^2}{8.5 - \frac{1.5^2}{32}} = 11.9$$

By detaching D and the roller on AB, and pivoting AB about a fixed point between A and B, the device may be used for any radius from 10 to about 1.5.

This leaves a gap between 10 and 11.9, but values of R_d within that range can be obtained by moving B towards A so as to obtain a new value of a which is considerably, instead of only slightly, less than the desired value of R_d.

For example, if the new value of a is 6 and the minimum practicable value of b is 1.5 as before, the minimum attainable value of R_d with the segment in use is

$$\frac{6_2}{4.5 - \frac{1.5^2}{32}} = 8.1$$

Now by assigning values slightly greater than 1.5 to b, values of R_d lying in the range of 10 to 11.9 may be obtained.

In an actual dressing device, the line XX of Fig. 4 is inclined at angle ϕ_n to the axis of the grinding wheel and is the center line of a slotted arm on which the sector D and the pivot pin B are fixed. The arm is mounted, with provision for angular adjustment, on a plate that also carries the corresponding mechanism for the other flank of the grinding wheel and also a mounting for the third diamond that dresses the tip of the wheel. There are several inversions of the mechanism outlined in Fig. 4, but in every case a spring is required to hold the roller against the segment. The whole dressing device should, of course, have easy radial adjustment in relation to the grinding wheel so that the reduction in the diameter of the wheel may be taken care of without making separate adjustments of the three diamonds.

In using any device of this nature, the procedure is to adjust the dressing device in accordance with calculation based on the radius of the desired circular arc and the position of its center in relation to the dressed tip of the grinding wheel. The path of the tip-dressing diamond is HJ in Fig. 3. When the flank-dressing diamonds are symmetrically set in relation to the central transverse plane of the grinding wheel, the lines containing the pivots and the diamond points must intersect at the distance PN (mean radius less root radius) from HJ.

The dressing device, set to the calculated figures, is applied to the grinding wheel, which is then used to grind the worm. The dimensions of the worm threads are accurately checked, and the dressing device is readjusted so as to neutralize the observed errors.

While some may find fault with a procedure that is mathematically imperfect, and which relies on the machine setter to accommodate the theoretical errors, it is common in machine shop practice for the machinist to make adjustments that produce the right result without any carefully reasoned prior justification. The machinist soon develops an aptitude for finding the answer by intuition. The type of wheel-dressing device described here lends itself well for judgment of this sort and has the great advantage that it does not require a former plate or other special fitting for each new job.

An Example Showing How the Developed Formulas are Applied

To show the practical application of the formulas given in the preceding text, an example is worked out in the following paragraphs. Certain basic information is given, and from this the radius of curvature of the grinding wheel profile and distance for locating the center of this radius are calculated, using formulas and information given in the first part of this article.

The given information is as follows:

Number of threads in worm, $N_w = 4$
Tip radius of worm, $r_t = 2.300$
Mean radius of worm, $r_m = 1.850$
Root radius of worm, $r_r = 1.400$
Axial pitch of worm, $p_x = 1.420$
Normal pressure angle at mean diameter, $\phi_n = 25$ degrees
Tooth thickness at mean radius is equal to half the pitch at the mean radius.
Outside diameter of grinding wheel = 12.000
(All linear dimensions are in inches.)

The calculations are as follows:

$$\tan \lambda_t = \frac{N_w p_x}{2\pi r_t} = \frac{4 \times 1.420}{2\pi \times 2.300} = 0.3930$$

Therefore

$$\lambda_t = 21.46 \text{ degrees}$$

$$\tan \lambda_m = \frac{N_w p_x}{2\pi r_m} = \frac{4 \times 1.420}{2\pi \times 1.850} = 0.4886$$

Therefore

$$\lambda_m = 26.04 \text{ degrees}$$

U = Root radius of worm + tip radius of grinding wheel

$$= 1.400 + 6.000 = 7.400$$

$$U - r_t = 7.400 - 2.300 = 5.100$$

From Equation (4), the radius of the profile of the grinding wheel is

$$R_w = \frac{\sin \phi_n}{\sin^2 \lambda_m}\left[\frac{(\lambda_m - \lambda_t)^\circ}{6}(U - r_t)\cos^2 \lambda_m + r_m\right]$$

$$= \frac{\sin 25^\circ}{\sin^2 26.04^\circ}\left[\left(\frac{26.04 - 21.46}{6} \times 5.100 \cos^2 26.04\right) + 1.850\right]$$

$$= \frac{\sin 25^\circ}{\sin^2 26.04^\circ}\left[\left(\frac{4.58}{6} \times 5.100 \cos^2 26.04\right) + 1.850\right]$$

$$= \frac{0.4226}{0.439^2}(3.893 \times 0.807 + 1.850) = 10.95$$

The normal pitch at the mean radius is equal to the axial pitch multiplied by the cosine of the lead angle at the mean radius, which in this case is

$$1.420 \cos 26.04 \text{ degrees} = 1.276$$

Hence the normal tooth thickness at the mean radius is 0.638 and the length PC in Fig. 3 is one-half the normal tooth space which is equivalent to one-half the normal tooth thickness, or 0.319.

Thus

$$PA = PC \cos \phi_n = 0.319 \cos 25^\circ = 0.289$$

Hence

$$PS = PA + R_w = 0.289 + 10.95 = 11.24$$

and so

$$QS = PS \cos 25^\circ = 10.19$$

and

$$QN = PS \sin 25^\circ - PN$$
$$= 10.19 \times 0.4226 - (r_m - r_r)$$
$$= 4.31 - 0.45$$
$$= 3.86$$

* * *

In 1951, shipments of lathes were valued at $170,500,000, 90 per cent over 1950. Engine lathes accounted for 32 per cent of the total value of lathes shipped.

A.G.M.A. Holds Semi-Annual Meeting

CHICAGO'S Edgewater Beach Hotel was the scene of the semi-annual meeting this fall of the American Gear Manufacturers Association. A registration of 215 members and guests set a new attendance record for the three-day meeting. Among the technical sessions were those held on worm-gearing, speed reducers, fine-pitch gearing, gear-motors, gear-cutting tools, mill gearing, automotive gearing, aircraft gearing, inspection, lubrication, and nomenclature.

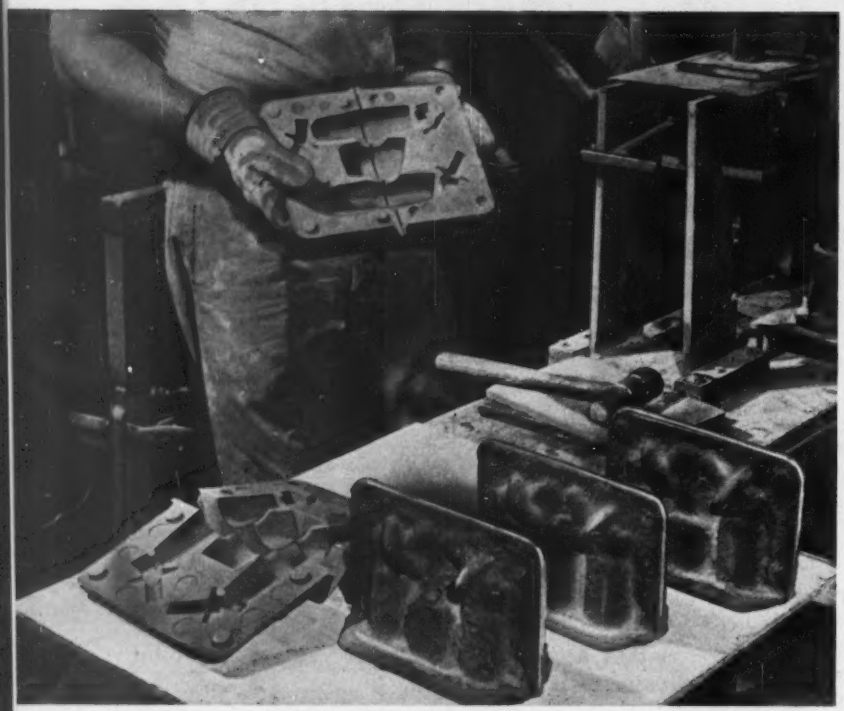
Two excellent papers were presented: "A New Look at the Scoring Phenomena of Gears," by Bruce W. Kelley, research engineer, Caterpillar Tractor Co., Peoria, Ill., and "Economics of Machinery Replacement," by Robert S. Collier, plant manager, Cincinnati Milling Machine Co., Inc., Wilmington, Ohio.

Mr. Kelley in his paper claimed that the magnitude of the scoring condition of gears was on the increase owing to current engineering preference for lighter non-additive oils. These oils are commonly required in high-temperature service conditions, and are primarily developed for maximum stability, rather than for resistance to scoring. Scoring is brought on by the failure of the oil film, and eventually leads to the complete failure of the gear. Seven factors were considered as having a significant effect on scoring resistance: pressure; absolute surface velocities and the resultant relative sliding velocity; viscosity and composition of the oil; temperature of the oil bath; properties of the material; surface finish; and surface treatment.

In discussing the economics of machinery replacement, Mr. Collier explained that with all the advance in technology and methods of doing business, the technique of analyzing the replaceability of facilities is substantially the same as it was a hundred years ago. A good formula for replacement must consider direct and indirect labor savings; depreciation and obsolescence; interest on money invested; and maintenance cost differential between old and new equipment. The Machinery and Allied Products Institute (MAPI) formula, while not a perfect solution, was, the speaker said, the best answer to the replacement problem that has been devised up to the present time.

In Shops Around the

Camera Highlights of Some Interesting Operations Performed in Metal-Working Plants throughout the Nation

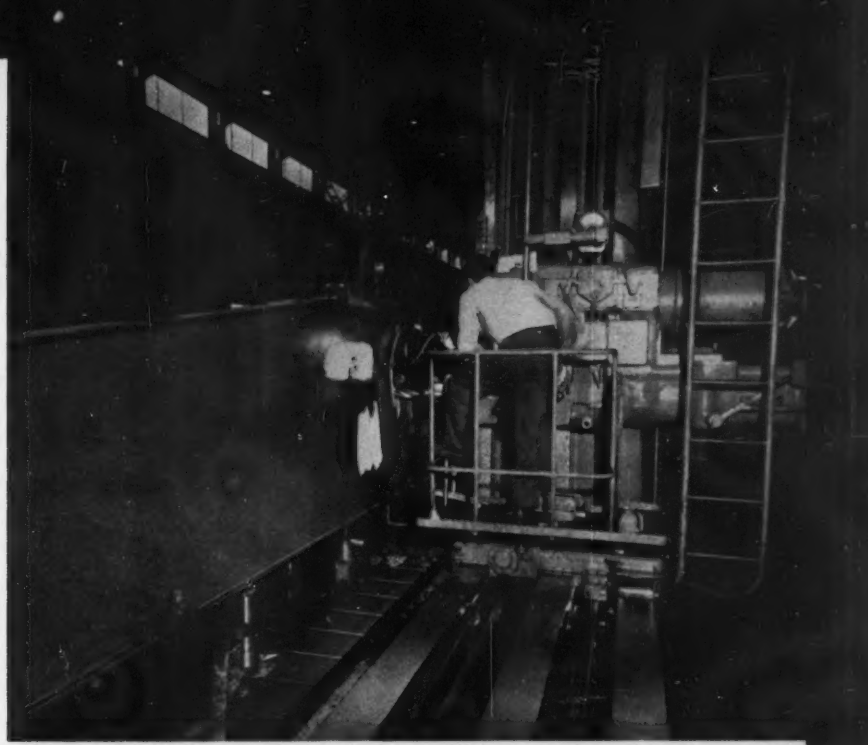


West Coast debut of shell molding in the foundry of the Solar Aircraft Co., San Diego, Calif. The process lends itself admirably to the production of high-quality stainless-steel and alloy-steel castings. Illustrated are typical shells, approximately 1/4 inch thick, formed of a solidified mixture of sand and a thermosetting plastic.



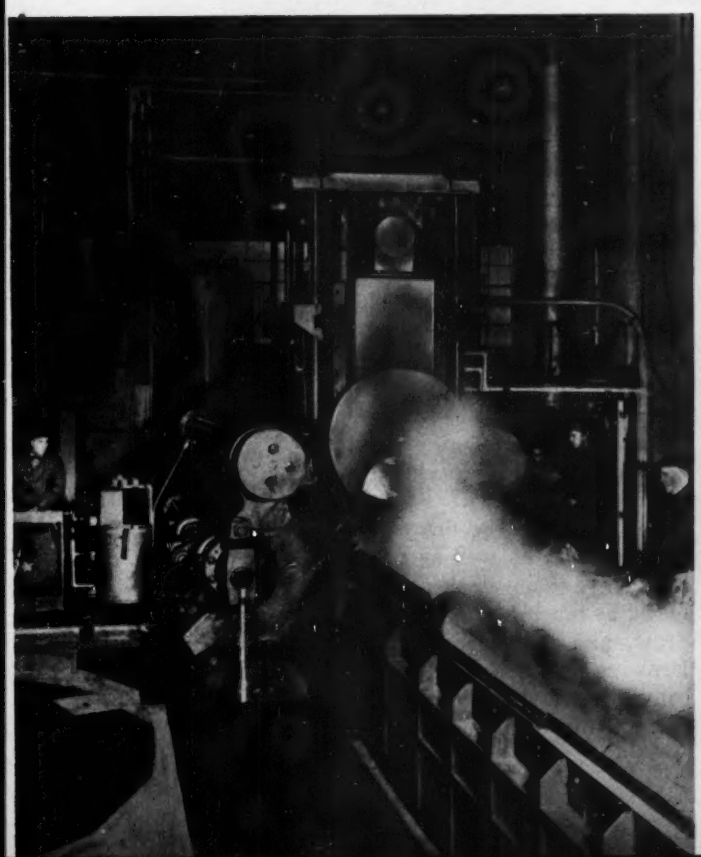
Steel cowl panels for Dodge trucks are stacked after being formed by a plastic die in a 100-ton press, demonstrating first successful production use in the industry of a plastic die to shape large panels. Several hundred panels have already been formed by the plastic die in Chrysler Corporation's Nine Mile Press Plant, Detroit, Mich.

Country



The much-publicized new cannon of the Army's Ordnance Department, capable of firing atomic missiles, is in production at the Neville Island, Pittsburgh, Pa., plant of the Dravo Corporation. Illustrated is a drilling operation on the gear housing for the carriage of the gun. A Giddings & Lewis horizontal boring, drilling, and milling machine is used for the job.

Delivery end of the 2500-ton hydraulic press designed and built by Hydropress, Inc., New York City, for extruding steel by the Ugine-Sejournet glass lubrication process at the Babcock & Wilcox Co., Beaver Falls, Pa. Actual extrusion takes from two to four seconds, yielding a tube from 20 to 60 feet long, depending on the length and cross-section of the billet.



An "Aircomatic" head, product of the Air Reduction Co., Inc., operates in an atmosphere of helium gas in seam-welding 3/16-inch thick deck balks of 61S-T6 aluminum at the J. S. Thorn Co., Philadelphia, Pa. The head runs along a track parallel to the 15-foot work lengths. Welding rate is 100 inches per minute. A mechanical feed supplies 3/32-inch 43S filler wire.





Having

Curtailment of Nickel for Non-Military Items has Found Many Fabricators of Stainless Steel Replacing Chromium-Nickel, or 18-8, with Straight-Chromium Grades. This Article Compares Both of the Grades and Reviews the Changes in Technique that are Essential to Successful Conversion to the New Grades.

By RICHARD E. PARET
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Fig. 1. AISI 430 can be successfully deep-drawn into sink basins. The alloy can be reduced 20 to 25 per cent of the blank diameter on the first draw, 15 per cent on subsequent draws.

MOST popular of the new straight-chromium stainless steels is AISI 430, together with its free-machining modification, 430F, and a special titanium-containing alloy having good welding qualities, 430T. These stainless grades approach several of the 18-8 grades in strength, corrosion resistance, weldability, and workability. Durable, attractive, and economical, they are the most versatile of the straight-chromium stainless steels, and pose the fewest change-over problems for the design engineer.

But using the chromium stainless steels, requires a thorough analysis of the design of the item in question, in terms of service requirements, manufacturing efficiency, and over-all cost. Straight-chromium stainless has its own characteristics which must be carefully considered before successful replacement of chromium-nickel stainless can be made. In Table 1 is a comparison of the chemical compositions of various stainless steels.

Users of the 18-8 stainless grades will immediately find a difference in the mechanical properties of straight-chromium stainless. For example, in the annealed condition there is a difference in ductility, as can be measured by the percentage of elongation. The elongation value of AISI 302 is almost twice that of 430. In the straight-chromium grades, the smaller spread between the tensile and yield strength reduces the range of plastic deformation. Certain fabricating practices must consequently be modified. Physical properties of various stainless steels are compared in Table 2.

Drawing May Require an Extra Step

AISI 430 can be drawn into deep, intricate shapes about as well as the best quality deep-drawing carbon steel, and can actually be reduced as much as 20 to 25 per cent on the first draw, and 15 per cent on subsequent draws. Drawing practice may have to be modified in converting from AISI 302. The latter has unusually fine drawing properties and may be

Trouble with "430" Stainless?

reduced as much as 35 to 40 per cent on the first draw. For AISI 430, at least one extra draw is often necessary, and in especially severe working, annealing between draws may also be required. If annealing should be required, it is important to remember that the straight-chromium steels experience grain growth over 1600 degrees F. Annealing should be carried out at 1400 to 1500 degrees F., never above 1550 degrees F.

When converting to AISI 430 from 302, it may be necessary to use a larger size blank. This is because the straight-chromium grades tend to stretch locally and thus require more metal to flow into the dies. Because of the directional properties of AISI 430, the flange on round parts occasionally develops so-called "ears" during drawing. This same property may also cause a ropy texture to develop on the surface of drawn parts. Eliminating this ropiness requires that additional finishing steps be specified. Like mild steel, AISI 430 will show stretcher strains in some draws. This can be prevented by using temper stock.

Drawing can be made easier if the stock is warmed before working. Thus, some manufacturers suggest that blanks be dipped in boiling water immediately before drawing. In any event, it is suggested that cold stock first be brought to room temperature.

The selection of proper die materials is, of course, essential for successful drawing. Solid dies made from alloy tool steels of the non-deforming type (high-carbon, high-chromium) have been found most satisfactory Because of rapid wear, dies of ordinary cast iron are suitable for short runs only. Alloy cast irons containing chromium and nickel can, however, be used with good results. Hard cast bronze is suggested for the draw-rings since it has less tendency to gall or seize the steel than other materials.

To prepare dies for AISI 430 and its modifications, clearances between punch and die should approximate those for mild steel, somewhat less than those allowed for 18-8 stainless. Dies should be designed for a spring-back allowance of from two to three times that specified for mild steel. Radii should be more liberal—they might even be double those specified for 18-8. The radius of the draw-ring should be greater than that used for mild steel, and the ring should be well polished and buffed.

Before placing the blank in the drawing dies, a lubricant of high film strength and adhesive qualities should be applied. As with the 18-8's, the compound should be applied uniformly over the surfaces by brushing, swabbing, spraying, dipping, or rolling manually or mechanically. Most suitable stainless drawing lubricants contain either an oil or animal-fat base, and are highly sulphurized. They should be diluted to the proper consistency for the particular operation. A water-soluble solution is satisfactory for a light drawing operation of shallow depth, whereas an oil-soluble solution is required for a heavy draw. Latex- or plastic-base coatings applied to the blank act to protect the finish while functioning as a lubricant.

Generally, AISI 430 requires no more rugged press equipment or power than does AISI 302. Pressure-pads should, however, be more carefully adjusted to exert enough force on the blank to prevent wrinkling, but not so much as to prevent flow of the metal. This usually requires a double-action press. As a rule, presses and

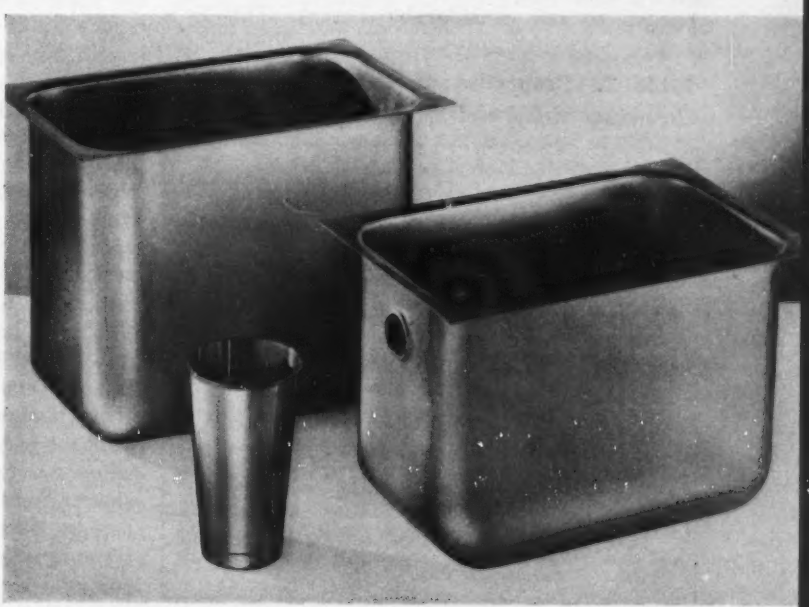


Fig. 2. Close-up view of basin (right) shown in Fig. 1, together with other deep drawn parts of AISI 430. This grade of stainless works about as well as the best quality of deep-drawing carbon steel.

Table 1. Compositions of Typical Chromium-Nickel and Straight-Chromium Steels

	Chromium-Nickel Steel	Straight-Chromium Steel		
	AISI 302	AISI 430	AISI 430F	AISI 430T
Carbon	0.08 to 0.20	0.12 max.	0.12 max.	0.10 max.
Manganese	2.00 max.	1.00 max.	1.25 max.	1.00 max.
Silicon	1.00 max.	1.00 max.	1.00 max.	1.00 max.
Phosphorus, sulphur, or selenium	.....	.....	0.07 min.	.....
Chromium	17.00 to 19.00	14.00 to 18.00	14.00 to 18.00	16.00 to 18.00
Nickel	8.00 to 10.00	.....	.....	.....
Molybdenum or zirconium	.....	.....	0.60 max.	.....
Titanium	.....	.....	.....	0.30 to 0.70

brakes can accommodate stainless-steel sheet up to one-half the thickness of their rated capacity for mild steel.

For most drawing operations, No. 2 strip finish (No. 2D sheet finish) is specified. AISI 430 is a sharp-yielding material and will show strain lines if No. 1 finish soft temper strip is produced. The blanks should be of sufficient diameter to retain a flange on the shell. If the drawn part is produced without this flange, season cracking of the side wall may result, particularly if the reduction is severe. As with the 18-8's, metal adhering to the draw-ring or pressure-pad should be removed with an oilstone saturated with kerosene, in preference to abrasive cloth or similar material.

Straight-Chromium Stainless Does Not Work Harden

Equally important from the design standpoint is the fact that unlike the chromium-nickel grades the straight-chromium grades do not work harden to any considerable extent. This is a distinct advantage if the material is to be spun. Quite often a deep draw is made after first spinning the material to rough shape. Television viewing tubes are made by this method. A special stainless is used, having the same coefficient of expansion as that of glass.

Cast-iron tools have been found satisfactory for spinning stainless steel, but a nickel-chromium iron treated for maximum hardness is especially recommended. The spinning tools resemble those used for copper, but are somewhat flatter and have a greater bearing surface. Roller type tools are better than those having a solid nose, since the former develop less heat.

Spindle speeds must be reduced to approximately two-thirds those used for mild steels. As a rule, AISI 430 can be spun about one-third as much as mild steel before an anneal is required. Yellow soap serves as a satisfactory lubricant but it must be completely removed before annealing is attempted.

Table 2. Properties of Annealed Sheets of Chromium-Nickel and Straight-Chromium Steels

	Chromium-Nickel Steel	Straight-Chromium Steel		
	AISI 302	AISI 430	AISI 430F†	AISI 430T
Ultimate tensile strength, pounds per square inch*	90,000	75,000	80,000	65,000
Yield strength, pounds per square inch	40,000	45,000	55,000	45,000
Elongation in 2 inches, per cent	50	25	25	30
Hardness (Rockwell B)	85	85	60	78

*The fatigue strength of these steels is approximately one-half the ultimate tensile strength.
†These values are for bar stock.

Lowered Ductility a Factor in Forming Operations

Swaging, coining, blanking, and shearing operations present no insurmountable problems in converting from AISI 302 to 430. Stainless steels must be sheared with smaller clearances than those used on ordinary steels. Because of its ductility, chromium-nickel stainless has to be cut almost clear through before it will snap off or break, whereas straight-chromium stainless will break after one-half to three-fourths of its thickness has been cut. Shear blades must be maintained to close adjustments, and should retain as keen an edge as conditions permit. Dull shear blades used in trimming a narrow margin on light-gage metal may drag and turn over the edge of the metal instead of parting it from the sheet. For annealed stainless, the thickness that can be handled in a shear will be one-half to three-fourths the rated thickness of the shear for mild steel.

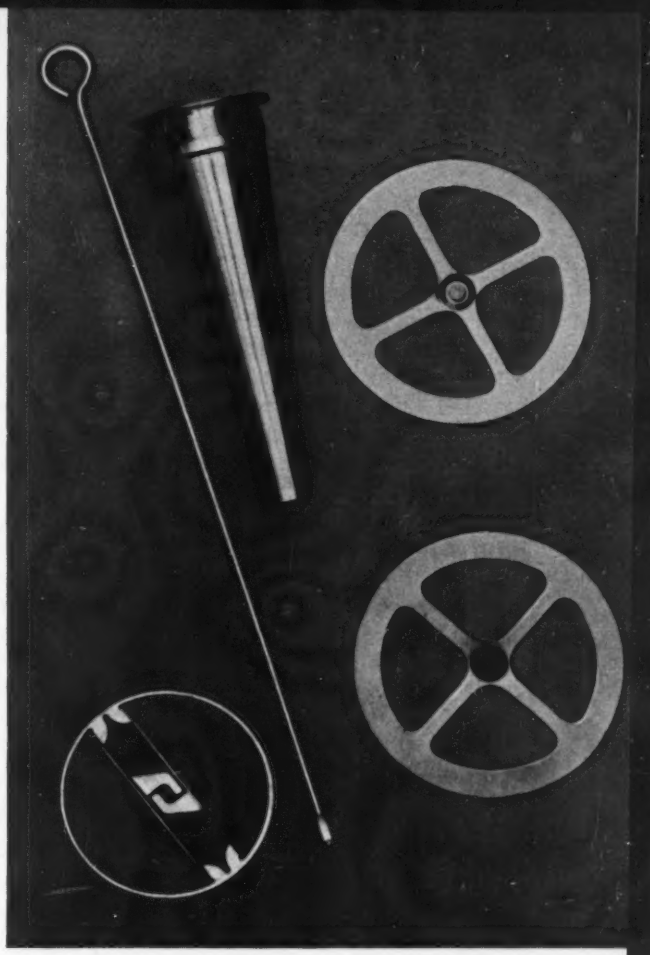


Fig. 3. These coffeemaker parts are now fabricated of straight-chromium stainless steel.

The straight-chromium grades, unlike the chromium-nickel grades, can be blanked or punched by setting the dies the same as for ordinary steels. Since these steels "break out," it is not necessary to cut all the way through them. However, the best grade of tool steels should be used for the blanking and punching dies. More power is required for AISI 430 than for mild steel, and a slower speed of operation is advisable. It is important, of course, to have and maintain very sharp punches and dies.

Where AISI 430 is to be bent, it is wise to design the product with maximum allowable radii—ideally, the radii should be twice those for 18-8. Bends in straight-chromium steels are apt to break if they are made parallel to the direction in which the strip has been rolled. The work should, therefore, be planned so that the most severe bends are made across the strip, rather than along its length. Bends of 90 degrees in material 18 gage or lighter usually give no trouble, but if the radius is too small, an "orange peel" finish may be created at the outside of the bend. This eventually can be lessened by specifying an inside radius of at least one metal thickness. If the material is heavier than 18 gage, the inside radius of a 90-degree bend should always be equal to at least one metal thickness.

Bends of 180 degrees in material lighter than 18 gage can be made if the bend is across the direction in which the strip has been rolled. If the bend is parallel to the rolling direction, the inside radius of the bend should be at least one metal thickness. This means that there should be room for two thicknesses of metal in the bend after forming. Bends of 180 degrees in material heavier than 18 gage require a radius of at least two metal thicknesses if the bend is across the rolling direction, and at least four, if it is parallel to the rolling direction.

Straight-Chromium Grades Exhibit Good Machinability

AISI 430 is easier to machine than AISI 302. Even so, there is a tendency of the chip to gall or build up on the cutting edges of the tool. This causes high tool pressures, high temperatures at the cutting point, and tearing of the machined finish of the work. Chips produced are brittle and stringy. All these unfavorable conditions can be made less severe by using sharply ground tools. Turning tools should be ground with a moderately heavy side rake of 8 to 15 degrees to allow for free cutting action. A smooth face on the top of the cutter will aid in preventing chip build-up.

For drilling operations, the normal drill point of 118 degrees should be increased to 140 degrees. And sometimes it may be necessary to grind chip-breakers into the flutes near the lips to aid in curling the chip. Threading tools should be ground with a 10- to 15-degree back rake to ease cutting pressures and to improve the machined surface. The use of sulphurized cutting oil is recommended for all threading operations.

In general, high-speed steel or carbide tools should be used. Set-ups must be rigid and the machine tool must have ample horsepower to deliver the prescribed rates of speed and feed.

Good practice after machining is to dip work in a 10 to 20 per cent solution of nitric acid, plus 2 per cent copper sulphate, at 140 to 160 degrees F. This treatment removes contamination from small particles of steel and prevents dulling of the stainless surface. Following the acid dip, the work should be rinsed thoroughly in water.

Heat-treatment may be desirable to relieve residual stresses in the metal. Prior to heat-treatment all lubricants must be removed from the surface.

Service Temperature Affects Brittleness

The temperature at which the product will be used is another design factor that must be taken into consideration. AISI 302, unlike most metals, remains ductile at extremely low temperatures. AISI 430 and the other straight-chromium stainless steels do not have this advantage. Slightly below room temperatures the fracture exhibited by AISI 430 changes from a ductile to a brittle type. Therefore this grade is not recommended for low-temperature use where impact resistance is a factor.

Performance of AISI 430 at high temperatures is much more favorable, in that it exhibits high resistance to scaling and oxidation. The alloy's low coefficent of expansion, as compared to the 18-8's, together with its high chromium content allows the tight protective scale formed under oxidizing conditions to be retained on the surface of the metal when the equipment goes through extended heating and cooling. Flaking is reduced and equipment life extended. AISI 430 resists destructive scaling up to 1550 degrees F. Nevertheless, the straight-chromium grades do not have the high strength at elevated temperatures that is characteristic of the 18-8's. The former also have a tendency to be brittle at room temperatures after prolonged service between 800 and 1000 degrees F. Ductility is restored, however, on reheating.

Domestic and industrial furnace parts (combustion chambers, baffle plates, flue liners, and furnace boxes), bakery oven liners and outer shells and air preheaters can be made of AISI 430 as well as 302. Here high mechanical strength is not as important as scale resistance.

Weld Ductility is Improved with 430T

AISI 430 welded joints may be somewhat brittle at room temperatures because of the grain growth resulting from the high welding temperatures required. Weld embrittlement is also caused by the formation of hard martensite around the grain boundaries at high temperatures. Annealing between 1400 and 1500 degrees F. will temper the martensite, partly alleviating the brittle condition. It will not correct grain growth, however, and the weld will not be restored to the full ductility of the base metal.

The use of AISI 430T (sometimes referred to as AISI 430Ti) does give improved weld ductility, since the titanium contained in the grade inhibits the formation of martensite. Welds are fairly ductile in both the as-welded and annealed conditions. This alloy is being specified more and more for welding applications.

Weld ductility can also be improved in straight-chromium stainless by reducing the heat input during welding. This limits the grain growth to some extent. Resistance spot-welding and inert-gas shielded-arc welding are processes which reduce heat input. The latter is ideal for sheet or very light plate. High welding speed can be obtained and the amount of fused metal held at a minimum. And, of course, the low heat input along the joint minimizes the structural change in the metal in the immediate area of the weld.

Atomic-hydrogen arc welding is an even faster process. It is often used for making corner joints and edge welds in very thin sheets. Metallic-arc welding, however, is the most versatile process for joining sheets of AISI 430. In metallic-arc welding, the amount of heat at the joint is substantially less than during oxy-acetylene weld-



Fig. 4. Metallic-arc welding straight-chromium steel. AISI 430 and 430T can be welded by all conventional methods except forge welding.

ing, and consequently the weld is more ductile. As a rule, oxy-acetylene welding is not recommended for joining either AISI 430 or 430T, since excessive heating of the base metal near the weld is involved.

Straight-Chromium Grades Warp Less

Because of the lower coefficient of expansion of the straight-chromium stainless steels, warpage during welding is less severe than with the 18-8 stainless steels. Moreover, the higher thermal conductivity of the former helps diffuse heat from the weld area. Nevertheless, to keep welded objects in shape, it is wise to employ jigs, clamps, and copper chill bars. Where filler metal is required, it is suggested that AISI 308 coated electrode or bare rod be used, if available, depending on the welding method. AISI 309, 310 and 347 can also be specified. These chromium-nickel materials provide a tough, ductile weld in place of the more brittle AISI 430 weld metal. Of course, this does not alter the effect of the heat on the parent metal adjacent to the weld.

Designers should note that welds made with chromium-nickel stainless filler rods cannot be color blended with straight-chromium stainless sheet by polishing. In case such a color blend is important, AISI 430 weld metal must be used. Designers should attempt to locate joints at the least stressed parts of the weldment. Good design will avoid external or internal notches such as are found in corner joints or T-joints where penetration of the weld metal is incomplete. On the other hand, a simple butt joint having full penetration is highly desirable, in regard to both stress and impact. Such a joint can often be arranged with a little planning.

In general, the technique for welding AISI 430 wire is similar to that used for 302 wire, although welding time must be more carefully controlled. As the wire diameter decreases, for example, the necessity for a short welding time becomes more important. Thus, heating is localized at contacting wire surfaces, and the crushing of smaller sections is avoided. A welding machine equipped with full electronic control and capable of synchronous current application is recommended.

Either of two related electrical resistance processes can be used to obtain butt joints in AISI 430 wire: flash-butt welding or upset-butt welding. The heat- affected zones near the weld are smaller when using the flash-butt process. For either flash-butt or upset-butt welds, the lowest current that will complete the job in the shortest time should be used. Heat flow into the wire should be held to a minimum. The current-carrying jaws should be as small as possible, yet large enough to permit adequate flashing or upsetting. In this way, only a small amount of wire reaches a temperature high enough to experience any grain growth.

While butt joints in AISI 430 wire cannot be expected to equal the ductility of joints in 18-8 wire, they can be rendered less brittle by annealing. This can be done in the welding machine by unclamping the joint and removing it from the contact jaws. The jaws can then open to their normal position. By removing the weld flash and holding the welded part in contact with the jaws, an intermittent current can be passed through the joint until it is heated to a dull cherry red color, about 1450 degrees F. After the annealing temperature is reached, the wire can be cooled in air.

Corrosion resistance of AISI spot-welded joints deserves some attention. Under some conditions, folds or crevices around the wire joint afford a point for corrosive attack. This so-called bleeding, or staining, can be minimized by cleaning and electropolishing to eliminate accumulated weld scale and surface roughness.

Buffing AISI 430 Stainless Easily Performed

The straight-chromium stainless steels are not difficult to buff and polish. In fact, in many instances the bright rolled finish of these alloys is quite satisfactory with only a superficial buffing. Polished finishes obtained with an abrasive, however, may be a bit more expensive than those obtained on AISI 302. This will surely be true if the product has been severely formed, since stretcher strains and ropiness require extra grinding for their removal. Even so, AISI 430 develops a higher color than can be produced by the same amount of work on 302. Fully polished, the surface resembles chromium-plating.

Electropolishing of AISI 430 stainless has proved practical on a number of kitchen accessories. Results, however, are not quite comparable to those obtained with 302.

Straight-Chromium Grades are Magnetic

There are two more points that should be borne in mind when planning to use straight-chromium stainless. First, unlike the 18-8 stainless steels, the straight-chromium grades are magnetic. They should not be specified for applications where non-magnetic material is needed, such as in panels between bushings or transformer coil supports. Second, the straight-chromium grades are less corrosion-resistant than the chromium-nickel grades. For most applications, however, the straight-chromium grades

are entirely satisfactory in this respect. In doubtful instances and in the absence of actual service data, it is strongly recommended that corrosion tests be made before replacing a chromium-nickel grade with a straight-chromium grade.

In contemplating the use of straight-chromium stainless, it is important that the feasibility of economical production and market acceptance of the product be established before investing any time in the drafting-room or making any inventory commitments. Consultation with the steel supplier will avoid many pitfalls.

* * *

Huge Gage Demonstrated for Checking 90-Millimeter Ammunition

What is believed to be the largest gaging device in the world was recently designed and built by the Sheffield Corporation, Dayton, Ohio, in cooperation with ammunition experts of Picatinny Arsenal for checking loaded and assembled rounds of 90-millimeter ammunition. This automatic gage was demonstrated at the Sheffield plant on October 31 before distinguished representatives of the Armed Forces and men prominent in industry.

The huge-sized gage weighs approximately 10 tons and is known as the "Chambermatic." Each round of ammunition weighs 43 pounds and measures 3 feet in length. The gage receives the ammunition after the latter has been filled with its high explosive bursting charge and propelling powder, and has been completely assembled. Each round is presented to the maximum profile and alignment chamber gage by mechanical means. The chamber gage corresponds in shape to the chamber of a gun, and its dimensions are controlled within a few ten-thousandths inch.

If the chamber gage can close over the ammunition within prescribed limits, the ammunition is acceptable and is automatically carried out of the machine. Any eccentric, misaligned, or oversized rounds are, however, rejected automatically and leave the machine segregated from acceptable ammunition. The machine provides assurance of ammunition quality at lower inspection costs.

* * *

Foundation for Education and Research

Recognizing the grave shortage of engineering students in the United States and the urgent importance of metals research to the security of the free world, members of the American Society for Metals have voted an initial $650,000 for the establishment of a Foundation for Education and Research. Assets of the Foundation each year will provide an income of about $30,000 for the use and benefit of the public, either through education and research carried on by the Foundation or through the support of educational and research activities.



Dignitaries present at the demonstration of the Sheffield "Chambermatic" included (left to right) Louis Polk, president, Sheffield Corporation, Dayton, Ohio; Captain Wood, Louisville Ordnance Plant; Major General E. L. Ford, Chief of Ordnance, USA; Major General E. L. Cummings, chief, Industrial Division, Office of the Chief of Ordnance; Major General Leslie Simon, chief, Ordnance Research and Development Division, USA; and Brigadier General William P. Farnsworth, Wright-Patterson Air Force Base, Dayton, Ohio.



How Jet-Engine Combustion Chambers are Fabricated

By LAWRENCE A. PRCHAL
Engineer in Charge of General Electric Project
Ryan Aeronautical Co., San Diego, Calif.

COMBUSTION chambers are the hottest components of turbo-jet engines, and must be fabricated in such a manner that they will withstand a high-velocity flow of gas as well as extreme temperatures. At top speed, the General Electric J47 jet engine "swallows" several tons of air a minute. The air is compressed and fed to the combustion chambers where the fuel is burned. Only a small portion of the air is consumed in combustion. The tremendous heat of the blast expands the balance of the air and causes it to rush through the transition liners and force its way between the turbine buckets. The heat output is equivalent to that of a steam plant required for heating a fifty-story building with 4000 offices.

Combustion chambers for the jet engines mentioned have inner components of Inconel and outer components made from stainless steel. In the practice of the Ryan Aeronautical Co., San Diego, Calif., whose methods are here described, the Inconel and stainless steel are blanked in dies by Warco eccentric-gear mechanical presses, and are then rolled into cylindrical form. One of the presses installed for operations of this kind has a capacity of 600 tons. It weighs 230,000 pounds and is installed on 60-foot steel piles. The use of close-fitting steel dies eliminates the need of deburring the blanked sheets.

The outer combustion chamber components are next spot-welded, after being set to the required diameter, in machines of the type seen in Fig. 1. With the parts accurately aligned and held in place by means of an ingenious clamp, twelve electrodes simultaneously actuated by hydraulic cylinders are moved horizontally to perform the welding operation.

The cap and exit shells are then seam-welded

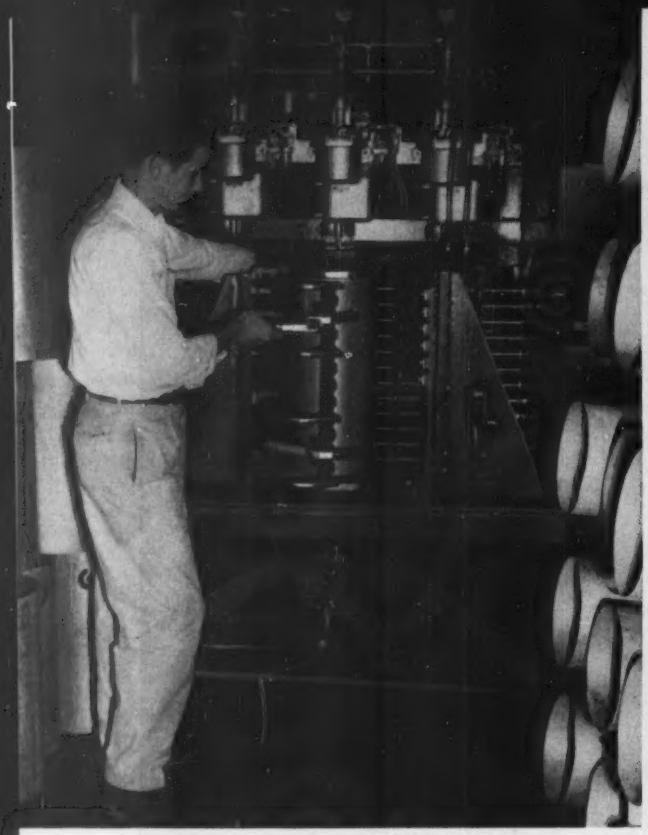


Fig. 1. The main shells of outer combustion chambers are spot-welded in an automatic machine which makes twelve welds simultaneously.

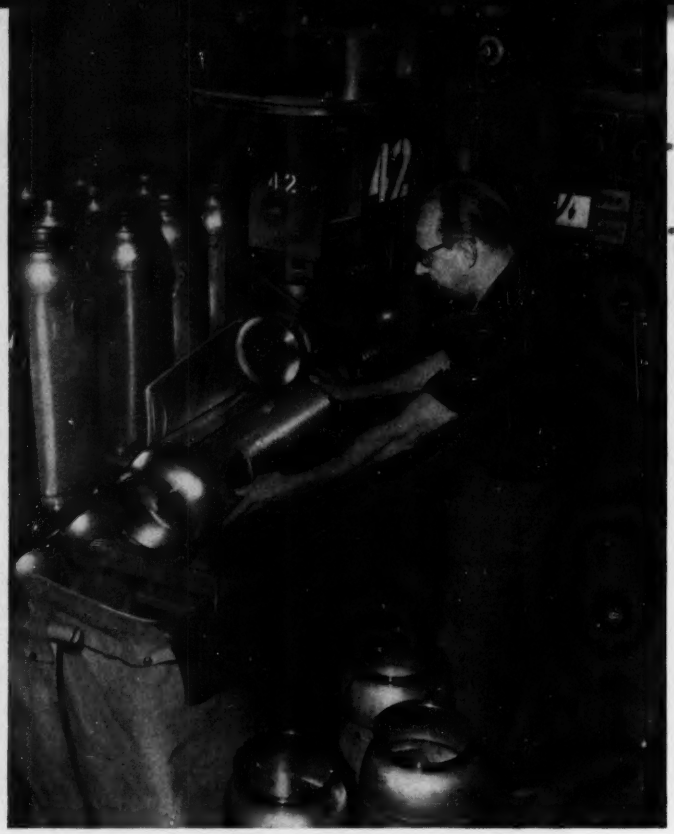


Fig. 2. Seam-welding the cap and exit shells to the main section of outer combustion chambers by the resistance welding method

Fig. 3. Punching holes in inner combustion chambers, accurate as to location and shape, with unusual punch and die equipment



Fig. 4. Four spot welds are made automatically in assembling the cap and exit ends to the inner combustion chambers.

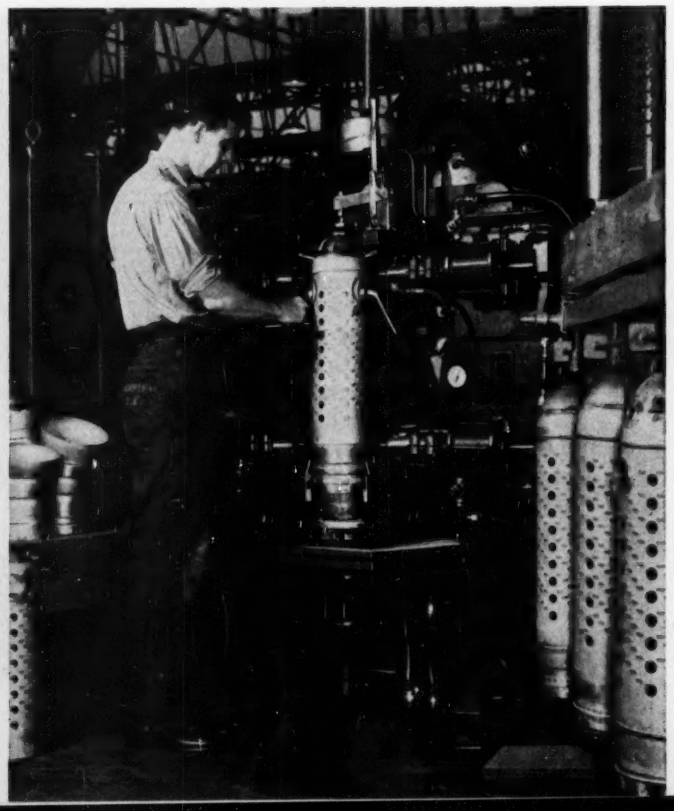




Fig. 5. Completed inner combustion chambers moving on a conveyor from a spot-welding machine, past an inspector to the shipping point

to the outer combustion chambers in a Sciaky electric resistance welding machine, as illustrated in Fig. 2. The work is rotated on rollers to permit making the circular welds.

The main section of inner combustion chambers is rolled and seam-welded with automatic Heliarc type machines. Then holes and louvers are pierced through the main section on a Verson press tooled up as illustrated in Fig. 3. Ten holes are pierced with each stroke of the press, the work being indexed on the fixture between each stroke. Accurate alignment of the punching unit with the mandrel-like die is insured by ground lugs on the unit engaging finished pads on the die with each descent of the punch ram. The size, shape, and location of the apertures in the inner combustion chamber are important to efficient performance of jet engines.

One of the final steps in the production of the inner combustion chambers is the welding of the cap and exit ends to the chamber shell. This operation is performed with the special Thomson welding machine shown in Fig. 4, which automatically aligns the three parts. The aligning feature of this machine is a brass and copper arbor, which contains four pie-shaped segments at the top and bottom. The movement of a tapered pin, actuated by air pressure, expands these segments into the assembly, precisely aligning the inner chamber body and the cap and exit ends. Then four horizontal electrodes move in under pneumatic pressure to make four spot welds simultaneously. Exact alignment and concentricity are requirements of this assembly, as it must fit accurately in the outer chamber.

The assembly is indexed so that thirty-two spot welds can be made to complete the assembly. Then the chamber is welded along the seams with a Sciaky electric spot-welding machine, which makes a series of overlapping spot welds to form a gas-tight seam.

Inspection of both outer and inner combustion chambers is the final step in the manufacturing process, after which the chambers are boxed for delivery to the jet-engine assembly plant. The gravity conveyor which leads to the packing station is illustrated in Fig. 5.

* * *

Tool Alignment Data Available

The Small Defense Plants Administration has prepared a technical leaflet, "Proper Alignment of Machine Tools," to aid the small machine shop proprietor seeking defense contracts. The leaflet outlines standard techniques developed by machine tool manufacturers for aligning various machine tools to meet exacting production requirements. Manufacturers who wish to receive the entire series may get them by requesting the nearest SDPA field office to place their name on the list.

Impacting—An Important



Fig. 1. Typical Impacter (shown without stock-holding or feeding arrangement) on which two die-holders are driven together by means of compressed air.

AN important new method of metal forming called "impacting" has been developed by the Chambersburg Engineering Co., Chambersburg, Pa. Impacting is performed in mid-air on a unique new hammer—the Chambersburg Impacter seen in Fig. 1—equipped with two opposing members (impellers) that carry the dies for forming the work-piece. The reciprocating impellers of equal mass are driven together in a horizontal plane by compressed air in similarly opposed double-acting cylinders. Stock is positioned in the impact plane between the two dies, and the energy of the impellers is absorbed in deforming and heating the work-piece.

In impacting, uniform working of the metal is obtained, since the stock is worked equally from two opposing sides. With this method of two-directional forming, some parts of the work-piece travel through shorter distances than is the case in conventional hammer forging. For example, in flattening a sphere into a disc, the distance traveled by the metal during impacting is about 23 per cent less than on a conventional hammer. Since energy is the product of mass times distance, less energy is required for impacting.

Another advantage of impacting is that contact between the stock and the die occurs only when work is being done—unlike other methods wherein the heated stock is in contact with at least one die member for an extended period. The shorter contact periods permit lower operating die temperatures and result in longer die life. Also, since the energy of the impellers is almost completely absorbed in deforming and increasing the temperature of the stock, the work can be formed with lower initial heat, and can be processed through multiple die stations without reheating. Shock and vibration have been practically eliminated in the impacting machine because of the almost complete absorption of energy in the forging and impellers, and a special machine foundation is not required. Thus, the Impacter can be located directly in the production line, and can even be placed adjacent to sensitive equipment.

Precision control is an essential requirement to successful operation of the Impacter, as it is necessary for the dies to strike simultaneously and repeatedly in the same plane of impact. Movement of the impellers, to which the die inserts are attached, is controlled by electronic devices which cause the opening and closing of the inlet and exhaust air valves at the required instant and for the necessary interval. The plane of impact is maintained on center by means of an electronic compensator employing sensing heads which detect blow eccentricity. Correction may be made either manually or automatically.

Velocity of the impellers (and consequently the blow intensity) can be roughly controlled by varying the air pressure or, finely, by varying the timing of the valve openings. Blow intensity and the number of blows per interval of time can be pre-set on a program timing arrangement.

When combined with appropriate handling and control devices, one or more Impacters can be used for automatic forging, coining, extruding, or briquetting. Such a set-up is called the "Cecomatic" process. For several years, the Inter-

New Method of Metal Forming

national Silver Co. has been cold-forging stainless-steel knife handles with a single blow on a No. 6 Impacter rated at 6000 foot-pounds. In this installation, the unforged blanks are manually stacked on a conveyor belt that carries them to a twisting mechanism. The twister places each blank in the required position, and a feeder arm carries the handle into the space between the dies. Here an air vise grips the blade, and the blow is struck. As the impellers retract, the forged part falls into a container. In this way, a production of fifty per minute is obtained—more than double that obtained by previous methods.

Since the work is mechanically held in position during impacting, operator safety is increased. Also, the machine can be equipped with safety guards to prevent the operator from getting too near the work while it is being forged. A further safeguard is in the automatic prevention of accidental operation of the machine. Whenever the power is shut off to employ inching for die setting or any other reason, a blow cannot be struck until the operator manually resets the main supply valve.

A Cecomatic forging installation, Fig. 2, will be employed by the Packard Motor Car Co. for the precision forging of compressor rotor blades used in the General Electric Co.'s powerful J47 turbo-jet aircraft engine. To facilitate handling of the work, a carbon steel sprue is welded to the previously headed stainless-steel blank before forging. Automatic feeding mechanisms carry the blanks from hoppers to automatic induction heating units. These Tocco heating units, developed by the Ohio Crankshaft Co., operate on a frequency of 10,000 cycles and employ a unique method of laminated inductors to concentrate the flux.

Heated blanks are released into a chute which delivers them to a transfer device that loads the Cecomatic conveyor. As the blanks slide down

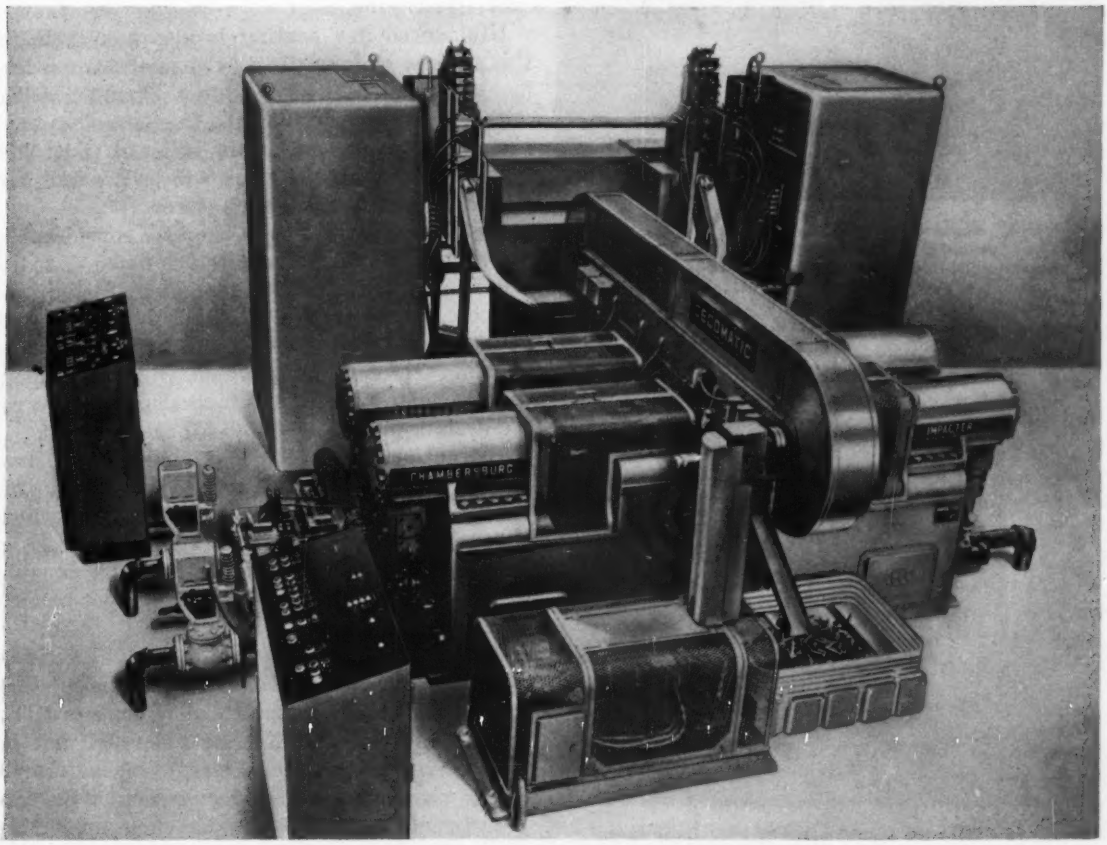


Fig. 2. Over-all view of a Cecomatic forging installation employed to precision forge rotor blades for aircraft turbo-jet engines. Blanks are heated by induction and automatically conveyed through two impacting machines.



Fig. 3. Preheaded stainless-steel blank to which a carbon steel sprue has been welded for handling is shown in position for the first blow on the Cecomatic forging installation shown in Fig. 2.



Fig. 4. Appearance of the rotor blade forging after blow has been struck on the first Impacter. The rough-forged blade is then automatically conveyed to the second impacting machine.



Fig. 5. Here the rotor blade has been finish-forged on the second impacting machine. Carbon steel sprue (seen above blade) is trimmed from forging by cut-off attachment at next station.

the chute, they pass beneath a Leeds & Northrup Rayotube temperature control unit which automatically causes underheated parts to be rejected. A heated blank that is being conveyed to the first Impacter is seen in Fig. 3. After rough-forging in this first machine, the blade appears as seen in Fig. 4. It is then automatically moved to the second impacting machine. The blade is shown in Fig. 5 after it has been finish-forged on this second machine. The forging is trimmed from the carbon steel sprue by a cut-off attachment, and separate chutes discharge the forgings and sprues to individual tote boxes. Separate control panels are provided —one for the two impacting machines and another for the complete Cecomatic process.

Production rates with this set-up will be from four to six times that of present methods, depending upon the size of the blade being forged. Packard will produce several size blades on the same machines, and it is estimated that the dies can be changed (for forging a different size blade) in about one-half hour. In addition to this installation, Packard has ordered a set-up in which two 15,000 foot-pound Impacters will be employed to forge turbine buckets for the same jet engine.

High-speed gas heating is also adaptable to this method of impacting. Considerable experimentation has been carried on at Chambersburg with a gas heater designed by the Selas Corporation of America, and it is believed that this method of heating the stock will be particularly applicable for larger work-pieces.

As impacting is a new process, considerable research and development is yet to be done in order to exploit all of its advantages. For this purpose, a research project has been initiated at the Engineering Experiment Station of Pennsylvania State College, which will supplement development work at Chambersburg regarding die design, plastic flow, and kindred subjects.

Limitations as to the maximum size of Impacter that will be practicable, will depend on the size of the impellers. Assuming that a limitation on impeller weight is 400,000 pounds, it would be practical to build an Impacter capable of delivering more than 3,000,000 foot-pounds of energy.

As adaptations of the Impacter and of Cecomatic forging are perfected, it is believed that forge shops can be made cleaner, more orderly, and safer. Since high head room will not be necessary with these machines, overhead cranes can be used more freely. Suspension of the forging in mid-air makes possible enclosure of the impacting area and the introduction of appropriate protective atmospheres if desired.

Materials OF INDUSTRY

The Properties and New Applications of Materials Used in the Mechanical Industries

Copper-Clad Steel Plate for Electrical and Welding Applications

Commercial production of copper-clad steel plate combining the properties of copper and steel has been announced by Lukens Steel Co., Coatesville, Pa. Lukens Copper-Clad Steel, as it is called, consists of a layer of copper permanently bonded to one side of a carbon steel backing plate. Two types of cladding are available —oxygen-free high-conductivity copper for special electrical applications, and phosphorous deoxidized copper for improved weldability. Both types are available with the thickness of copper equal to 10, 15, or 20 per cent of the total plate thickness.

These clad steels can be sheared, formed, or rolled according to standard procedures. Some of these applications include the fabrication of electrical apparatus, evaporators, tube sheets, hot water heaters, heat exchangers, and tanks.

Cond-Al – Aluminum Alloy for Field Windings

An alloy that is light in weight, high in electrical conductivity and usable in high-temperature operation has been developed by the General Electric Co., Schenectady 5, N. Y. This alloy, known as "Cond-Al," is used for field windings on steam turbine generators and its application now removes previous limitations on the size of steam turbine generators. It is composed of aluminum with very small quantities of iron, magnesium, and silicon.

Welding and Soldering Rod for Joining Non-Ferrous Metals

Aluminum- or zinc-base alloys can be joined more easily by the use of Chemalloy, according to Chemalloy Associates, Gillespie Airport, Santee, Calif. This alloy is used to join metals by soldering, brazing, or welding. No fluxing, cleaning, or other preparation of the metals to be joined is required. The alloy is a blend of 8 per cent aluminum, 8 per cent brass, 2 per cent lead and tin, and small quantities of silver and nickel with the balance zinc, which have all been combined with muriatic acid and other chemicals. It comes in the form of a cast triangular rod, a common size being 3/16 inch on a side in lengths of 12 1/2 to 14 inches.

Composition Developed for Improved Etching of Aluminum

A material designed to produce a heavier, more uniform etch on aluminum has been made available by Oakite Products, Inc., 126 Rector St., New York 6, N. Y. The advantages of "Oakite Composition No. 60," as reported by manufacturers employing aluminum-etching operations, include rapid etching, giving a controlled etch of any depth desired while imparting a velvet-like appearance to the surface; elimination of hard scale build-up on tanks and heating coils, the light, soft sludge which is formed being removed by a hose rinse; uniform etching without excessive foaming or fuming; and long life of working solutions. After etching, the parts can be rinsed readily in cold or hot water.

Fortified Lubricating Oil Extends Industrial Engine Service Life

An oil featuring a combination of additives which extend the service life of industrial engines has recently been placed on the market by the Shell Oil Co., 50 W. 50th St., New York City. "Shell Rimula Oil," as it is named, cuts down engine wear resulting from corrosion and fouling, with consequent reduction of oil consumption and frequency of costly overhauls. Its advantages have been found most pronounced in Diesel engines designed for increased power output on low-grade fuels, and in all engines that operate at low loads, intermittently, with high-sulphur fuels.

Automatic Hard-Facing of Tungsten Carbide

A NEW automatic hard-facing process, using a standard automatic Heliweld head and a unit for feeding bulk tungsten carbide, has been announced by Air Reduction, New York City. The process was developed as the result of a need for improved methods in depositing tungsten-carbide hard-facing material on tool joints for well-drilling rigs. Flexibility of the automatic Heliweld hard-facing unit, Fig. 1, has been proved by numerous tests which show that its use for the deposition of tungsten-carbide hard-facing material is limited only by the ability to position the work and the arc in the proper relationship to each other.

The manner of deposition of loose, granular, pure tungsten-carbide particles, Fig. 2, minimizes reduction of particle size by solution of the tungsten carbide into the base metal, and insures efficient particle distribution. This method also minimizes the heat-affected area adjacent to the deposit, as shown in Fig. 3. In operation, the Heliweld arc melts the base metal, producing an elongated pool, and the tungsten-carbide particles are poured into this pool behind the arc. The rate of tungsten-carbide feed from the vibratory hopper mounted on the Heliweld head is electrically controlled with a high degree of accuracy. Tests have shown that the abrasion resistance of deposits made by this process is very high.

The unit consists of an automatic Heliweld head with water-cooled nozzle and amplifier assembly, a Heliweld control panel, wire positioner assembly, vibratory hopper, 400-ampere direct-current arc-welding machine, and helium gas regulator. For automatic Heliweld hard-facing of a tool joint, 5 3/4 inches in diameter and made from S A E 8654 steel, a straight-polarity direct current of 290 to 320 amperes and 17 to 18 volts is employed.



Fig. 1. Equipment used in automatic hard-facing process includes Heliweld head, controls, vibratory hopper, and direct-current arc welder.

Tungsten-carbide particles are poured into the pool behind the automatic Heliweld arc at the rate of 90 grams per minute. The work is rotated at 1 R.P.M. to give a welding speed of 18 inches per minute. Helium shielding gas is supplied at the rate of 40 cubic feet per hour. Preparation for hard-facing consists of machining grooves, 1/2 inch wide by 1/32 inch deep, in the tool joint, and preheating the work to a temperature of 500 degrees F.

Fig. 2. Tungsten-carbide particles are fed from a vibratory hopper, and are directed into a pool of molten metal behind the Heliweld arc.

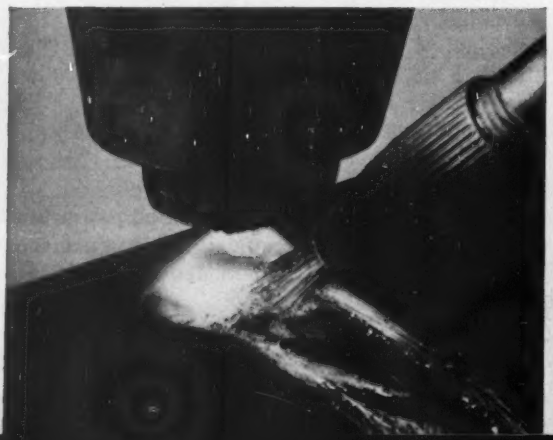
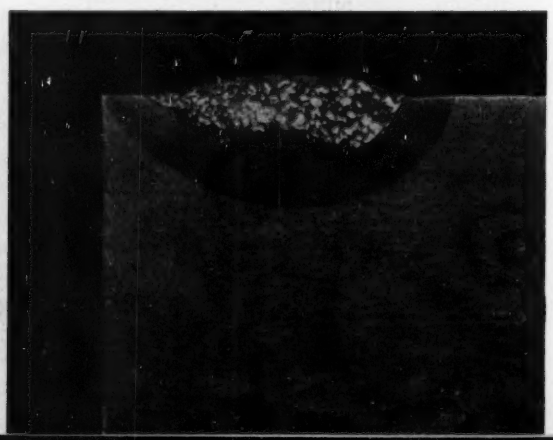


Fig. 3. Section through a tungsten-carbide deposit on a tool joint shows good distribution of the particles and only a narrow heat-affected zone.



High-Speed Routing Equipment is Remote Controlled

MINIMUM weight is an ever-present problem in aircraft building. It is achieved through judicious design and the removal of metal from sheets, forgings, and extruded shapes by a variety of machining, stamping, or other metal-working operations.

Routing has long been employed for machining metal from aluminum sheets, plates, etc., at high speed. Cutters mounted on the end of hinged radial arms are employed in routing to remove metal along straight or irregular edges of work-pieces and also to cut openings in sheets or plates for weight reduction. Generally speaking, the routing tool has been guided manually over the work through the use of a follower adjacent to the cutter which engages the follower block or template placed on the work.

In Fig. 1 is shown an Ekstrom, Carlson machine of the manually operated type being used at North American Aviation, Inc., Los Angeles, Calif., in a typical operation on aluminum wing grids. When the routing cuts have been completed, the wing grid will have an appearance similar to the grid illustrated in Fig. 2; obviously, a great proportion of the original stock will have been removed, all by routing. These wing grids are made from 75S aluminum plate and are usually 1 inch thick.

To speed up this kind of work, Ekstrom, Carlson & Co., Rockford, Ill., has recently developed the power-operated remote-controlled router shown in Fig. 3. A feature of this machine is that it is capable of cutting two 1-inch thick 75S-T aluminum-alloy plates—a maximum depth of 2 inches. With conventional manually operated routers, it is generally necessary to cut through 1-inch thick aluminum (particularly 75S-T alloy) with three or four passes in addition to a final finishing cut. With the new power-operated router, it is possible to cut this thickness of stock in one pass, and produce a finished surface that requires no further machining. As a result, such operations are completed in approximately one-fourth the time presently required, with a minimum of effort on the part of the operator.

Another feature of the power-operated, remote-controlled router is that the operator stands



Fig. 1. Routing an airplane wing grid on a manually operated machine, the type of operation for which Ekstrom, Carlson remote-controlled equipment has now been developed



Fig. 2. Typical wing grid, which has been produced from a solid aluminum plate by the routing method

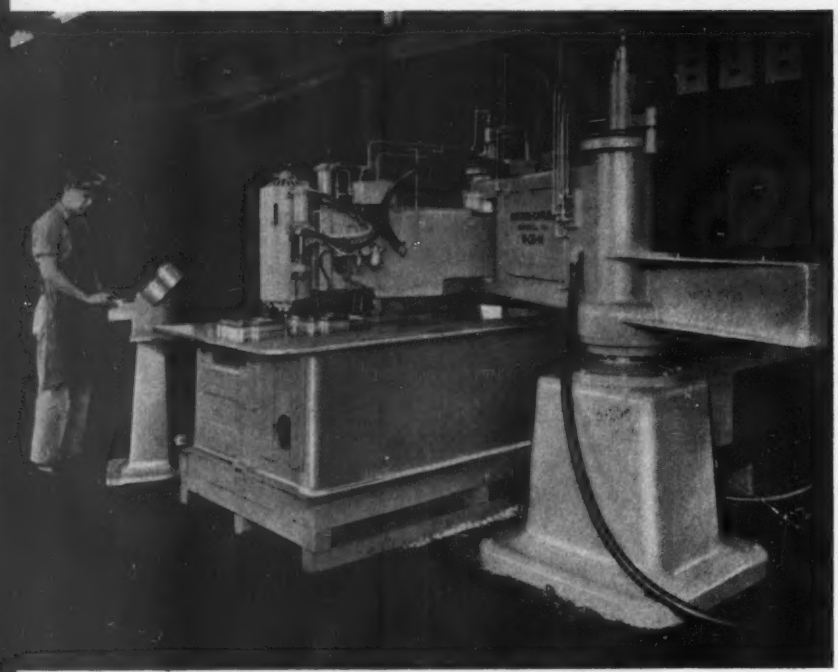


Fig. 3. Power-operated remote-controlled routing machine, which has been developed for the high-speed performance of operations such as illustrated in Fig. 1

at a panel several feet in front of the machine and completely controls all movements of the cutter over the work, simply by means of buttons which actuate an electrical-hydraulic circuit. The routing spindle may be run at speeds of either 14,400 R.P.M., or 7200 R.P.M., being driven by a 30/15-H.P. motor. As on a manually operated machine, the template follower is mounted on the spindle directly above the cutter, and is slightly larger in diameter than the cutter so that the surfaces being machined extend a predetermined amount beyond the edges of the templates or follower blocks.

On the remote control panel there is a "Run" button which is depressed to energize the complete electrical-hydraulic circuit and a master stop button which is depressed when it is desired to disconnect the circuit. Two push-buttons —one marked "Up" and the other "Down"—are provided for controlling the vertical router head movements. The feed of the cutter in an operation is continuously variable from 5 to 60 inches per minute, and is controlled by means of two other buttons, one of which is designated "Fast" and the other "Slow." There is a selector switch marked "Inside and Outside" which is operated

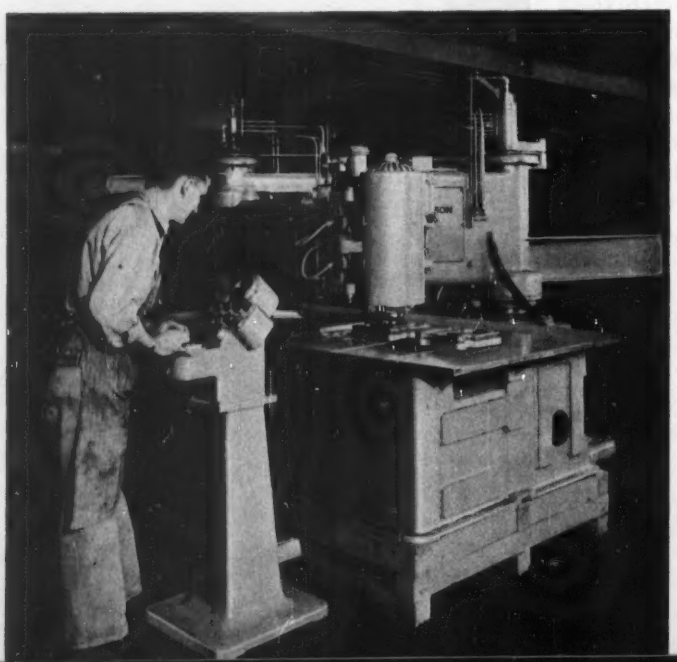
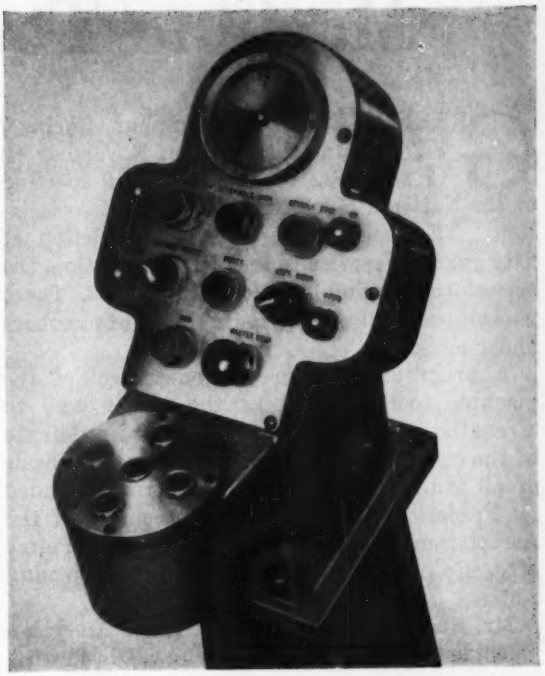


Fig. 4. Another view of the Ekstrom, Carlson remote-controlled routing machine as seen from a point adjacent to the operator's panel

Fig. 5. Close-up view of the push-button panel from which all movements of the power operated routing machine are conveniently controlled



to make the template follower push against the template in the proper directions as required for external or internal routing. Another selector switch marked "Right and Left" is operated to control the hinged router arms in working on the right- or left-hand side of the table center line on certain types of jobs. Finally, at the front of the panel, in a horizontal plane, there is a directional control plate with four push-buttons that are depressed to actuate the router head successively in the different directions. The fifth button in the center of the plate is depressed to provide a rapid traverse to the arms in positioning the cutter-spindle at the beginning or end of an operation.

Assuming that a square opening is to be cut in an aluminum plate, the router head would be moved quickly into position by depressing the rapid traverse button and the proper directional button. Also, because the cut would be an internal one, the selector switch would be turned to the "Inside" position. The "Down" button would then be depressed to cause the cutter to plunge into the aluminum sheet.

Then assuming that the cutter had entered the material near the line of cut closest to the operator, the direction of the cutter travel would next be to the right, this movement being accomplished by depressing the No. 2 button. Upon reaching the first right-angle turn, the No. 1 button would be engaged. When the next right-angle turn is reached, the No. 4 button would be engaged, and then Nos. 3 and 2 to complete the cut.

At the end of the operation, the cutter would be slightly backed off by depressing the No. 1 button after which the "Up" button — which controls the vertical head movement—would be depressed and the cutter would move up from the material. Circles can readily be cut by engaging the different buttons successively in the same manner as in cutting square, rectangular, or irregular shaped openings. Cuts around the outside edges of sheets or plates would be made by manipulating the buttons in the same manner as already described. However, it would first be necessary to turn the selector switch to the "Outside" position.

A routing head can be provided for this machine equipped with a retractable cutter spindle. With that type of head (driven by a 30/15-H.P. motor) the template follower contacts the template before the cutter is lowered, and upon the completion of the operation the cutter is raised before the follower, with the result that the work surfaces are never marred.

Cutter feeds up to 60 inches per minute are recommended for standard jobs, although the machine has been run at speeds up to 100 inches per minute. The traverse speed is 120 inches per minute. The motor is operated on high-frequency alternating current.

The inner and outer arm sections are semi-steel castings, and operate on Timken tapered roller bearings. Each arm is actuated by a hydraulic cylinder and a rack-and-pinion mechanism. The inner arm is provided with two pinions and racks, while the outer arm has a single pinion and rack.

All backlash in either arm during the cutter movements has been eliminated by the provision of magnetic brakes on the arms. During normal operation these brakes are energized by a low-voltage current to assure maximum smoothness of feed. When the cutter is plunged into the work or when the arms are otherwise brought to rest, the voltage to the brakes is automatically increased so that the arms are rigidly held in position.

Two ball bearings of high precision are located close to the spindle nose. They are lubricated by a fog or mist of lubricant. The supply of lubricant to these bearings is controlled by a solenoid-actuated valve that is interlocked with the motor starting and stopping control button. Another high-precision ball bearing near the top of the cutter spindle is grease lubricated.

Machine Tool Builders Hold

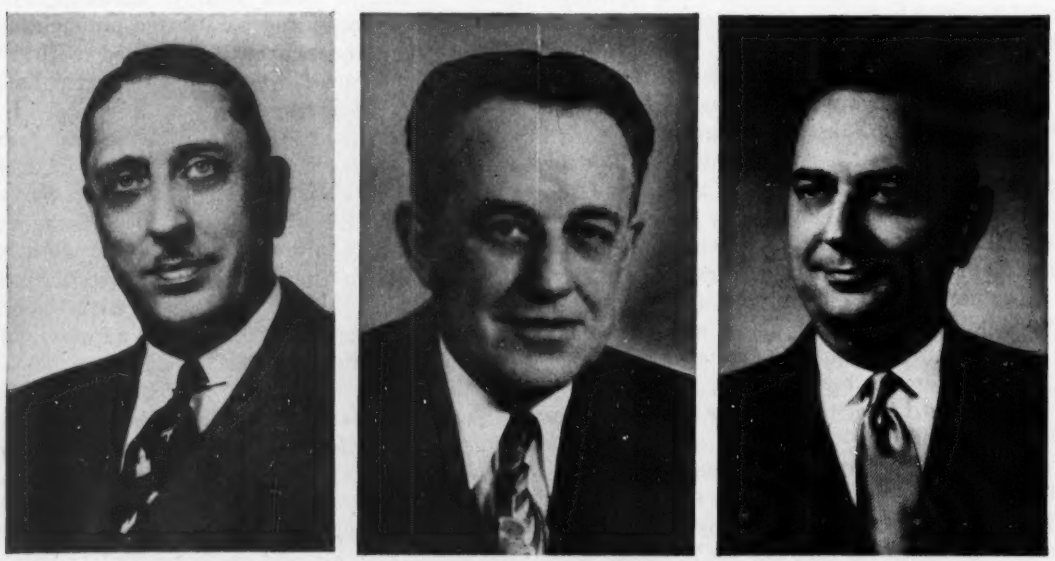
GREENBRIER, White Sulphur Springs, W. Va., was the location, November 12 to 14, inclusive, of the annual meeting of the National Machine Tool Builders' Association. The meeting marked the completion of fifty years of service to industry and nation, the Association having been founded in 1902. There was an unusually heavy registration of members and guests.

A program of progressive decontrol of the machine tool industry as the surest way to strengthen the industry for the future defense of the country and for its vital role as the basis of all industrial production, was recommended by Frederick S. Blackall, Jr., president of the Association, and president of the Taft-Peirce Mfg. Co., Woonsocket, R. I., in his opening address.

Mr. Blackall pointed out that if the American machine tool industry is to achieve its destiny as the backbone of our national defense, as a vital force in our foreign trade, and as the cornerstone of our great industrial economy, it should be freed with all possible dispatch from the artificial controls which bind it hand and foot at home and block its access to the rest of the world.

Continuing, he said "Through two wars in little more than a decade, this industry has willingly borne the yoke of the managed economy, accepting controls, restrictions, and regulations, and, let it be said, some measure of government aid —because a national emergency existed. But the problem of tooling for national defense is no temporary emergency. It will be with us into the fathomless future. Can anyone doubt that an industry such as ours, subjected indefinitely to government regulations, controls, and artificial support, will in time be weakened by the process? Is this indeed the way to assure to our nation the vigorous, vibrant, competitive machine tool industry which all men at long last seem to agree is prerequisite to our national security?

"To meet the challenge which faces us at home and abroad, this industry must be strong and aggressive, and that means that, above all, it must be competitive. We seek no subsidy from the Government; we want none. We do appeal for sound legislation relating to the amortization of our equipment for tax purposes. We do ask for recognition, in taxation and renegotiation, of the highly cyclical character of our business, so that we may be permitted, during our periodic bursts of feverish activity, to accumulate reserve without penalty, which will carry us through the inevitable droughts which always follow. We do want the opportunity to face and meet competition wherever it exists, confident that its stimulus will strengthen rather than weaken us, and, incidentally, make us a more effective instrument of the national defense."



The newly elected officers of the National Machine Tool Builders' Association are (left to right) president, Swan E. Bergstrom; first vice-president, Herbert L. Tigges; and second vice-president, M. A. Hollengreen

Fifty-First Annual Meeting

Mr. Blackall then outlined suggestions for solving internal problems of the Association such as a definite policy for exhibitions, a larger organization staff, and longer meetings to enable complete discussion of industry problems.

Upon the conclusion of his address, Mr. Blackall called attention to the special section of October MACHINERY which commemorated the Fiftieth Anniversary of N.M.B.T.A., and to the resultant publicity given the machine tool industry by newspapers in practically all of the industrial cities of the country. He called upon Robert B. Luchars, president of The Industrial Press, publisher of MACHINERY, to explain how this publicity was developed and to summarize the results. Mr. Luchars pointed out that thirty-five articles and editorials had appeared in the daily press thus far.

In his report, Tell Berna, general manager of the Association, briefly reviewed the various activities, and voiced the opinion that the sales conferences which have been held in recent years would become a permanent activity.

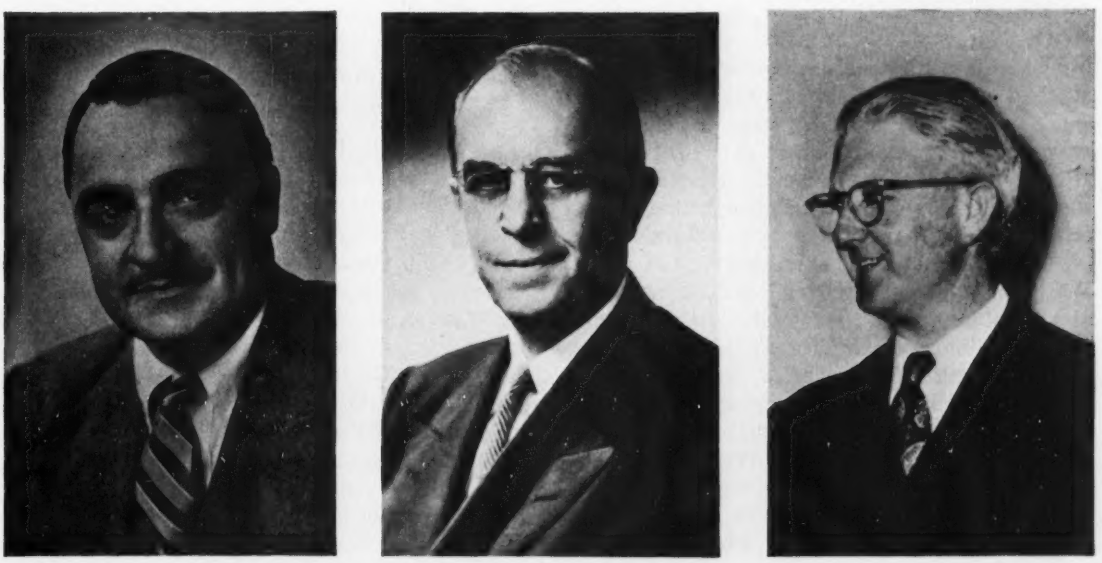
"Control versus Decontrol" was the title of a paper prepared by M. A. Hollengreen, chairman of the Committee on Government Relations, and president of the Landis Tool Co., Waynesboro, Pa. The paper was read by E. W. Miller, president of the Fellows Gear Shaper Co., because of the inability of Mr. Hollengreen to attend the meeting. This paper mentioned the fact that the nation cannot rely upon an immediate and extraordinary expansion of the machine tool industry because of the nature of its products and because it is not possible for the Defense Department, when an emergency comes, to tell machine tool builders what they expect that industry to do.

Mr. Hollengreen wrote that the obvious necessity is to set up a series of procedures which will be put into effect in the event of war. Each metal-working plant that produces civilian needs should have reserve equipment to supplement the machine tools already in that plant and enable it, with its existing administrative officers, engineers, and workmen, to begin overnight the production of some weapon that would be needed in a substantial quantity.

It now seems to be more widely understood in Washington that the purpose of our present program should be to develop such capacity for the production of weapons in large quantities, rather than to expend our resources in the manufacture of the weapons themselves.

It follows that the Defense Department must have a definite list of the weapons it thinks it will need in the event of war. It is then possible to build up the machine tool industry in an orderly manner, over a period of years, to meet this need.

Mr. Hollengreen pointed out that in the first year after the outbreak of the Korean War, the



Also elected at the annual meeting of the Association were Francis J. Trecker (left), treasurer; and J. C. Cotner and Alan C. Mattison (center and right), directors

value of the industry output amounted to $451,250,000 and in the next year, $896,800,000 —or practically twice as much. This substantial accomplishment was made in spite of the fact that over a year went by after the outbreak of the Korean conflict before responsible executives in Washington were willing to face the fact that machine tools would be needed in tremendous quantities to meet the needs of the defense program.

Alexander G. Bryant, chairman of the Renegotiation Committee, and vice-president of the Cleereman Machine Tool Co., reminded the machine tool builders that the probability of greatly reduced shipments beginning in 1953, the influx of foreign machine tools, and the prospect of a saturated market in the future are the three most important factors in their renegotiation proceedings.

According to Mr. Bryant, the peak of emergency production of machine tools is about to pass. The industry earned in 1951 and 1952 the profits that would normally be spread over several years, and those profits are being concentrated into a period of high excess profits taxes, price ceilings, and renegotiation. This factor has been given recognition by the Renegotiation Board in its regulations and all the Regional Boards must recognize its significance if machine tool builders are to be treated fairly. If it is not recognized, and if machine tool builders are not left with enough of the peak profits to tide themselves over the coming period of slack so that they can continue servicing and needed research and development, the industry will be seriously weakened and the country's defense capabilities impaired.

Mr. Bryant pointed out that the manufacture of critical machine tools was slowed down at the start of the present defense program partly because the industry had been weakened by the unwise renegotiation procedure of World War II. He expressed confidence, based on industry meetings with the Renegotiation Board, that renegotiation officials have a better understanding now of the problems of the industry than during World War II renegotiation. Mr. Bryant spoke at a seminar in which Joel Barlow of Covington & Burling also participated.

The dramatic recovery of the German machine tool industry to its pre-war size and strength, due partly to ECA financing, constitutes the greatest single threat to the American machine tool industry in its drive to regain the world market, according to Burnham Finney, editor of the *American Machinist*, who presented a paper which dealt with industrial progress in western Europe.

Other papers presented before the meeting were as follows: "Price Ceiling Problems," by Henry D. Sharpe, Jr., member of the Sub-committee on Costs, and president of the Brown & Sharpe Mfg. Co., Providence, R. I.; "The Washington Scene" by Ralph S. Howe, Director of the Metal-working Equipment Division of NPA and special assistant to the Defense Production Administrator; "Procurement Complications," by Everett M. Hicks, chairman of the Sub-committee on Procurement Policy, and vice-president and manager of the Grinding Machine Division of the Norton Co., Worcester, Mass.

The speaker at the dinner meeting was Henry Hazlitt, editor of *Newsweek*, who stressed the point that profits are the index to prosperity, employment, wage levels, and economical welfare, and that to be against profit is not only to be against capitalism but to be against human progress itself.

Swan E. Bergstrom, vice-president, Cincinnati Milling Machine Co., was elected president of the Association; Herbert L. Tigges, executive vice-president, Baker Brothers, Inc., was elected first vice-president; M. A. Hollengreen, president of the Landis Tool Co., was elected second vice-president and director; and Francis J. Trecker, president of the Kearney & Trecker Corporation, was elected treasurer.

New directors elected, in addition to Mr. Hollengreen, were J. C. Cotner, president of the Hydraulic Press Mfg. Co., and Alan C. Mattison, president of the Mattison Machine Works. Tell Berna was re-elected general manager, and Mrs. Frida F. Selbert, secretary.

* * *

Cement for Accurately Securing Bushings in Drill Jig Plate

A cement for locating and retaining drill jig bushings without distortion of the jig plate or misalignment of the hole pattern has been developed by Sheridan Products, Inglewood 3, Calif. This cement, known as "B-K No. 7," is especially recommended for use in "master tooling" operations that require the construction of complicated assemblies for irregularly shaped tools. It eliminates the necessity for lapping of press fit bushings after assembly and is not affected by drilling heat.

Bushings can be retained in steel, aluminum, or Fiberglas jig plates by using this cement. When cemented in holes drilled up to 0.015 inch over size, the bushings are said to require the application of a substantially greater pressure for removal than regular press-fit bushings.

INGENIOUS *Mechanisms*

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

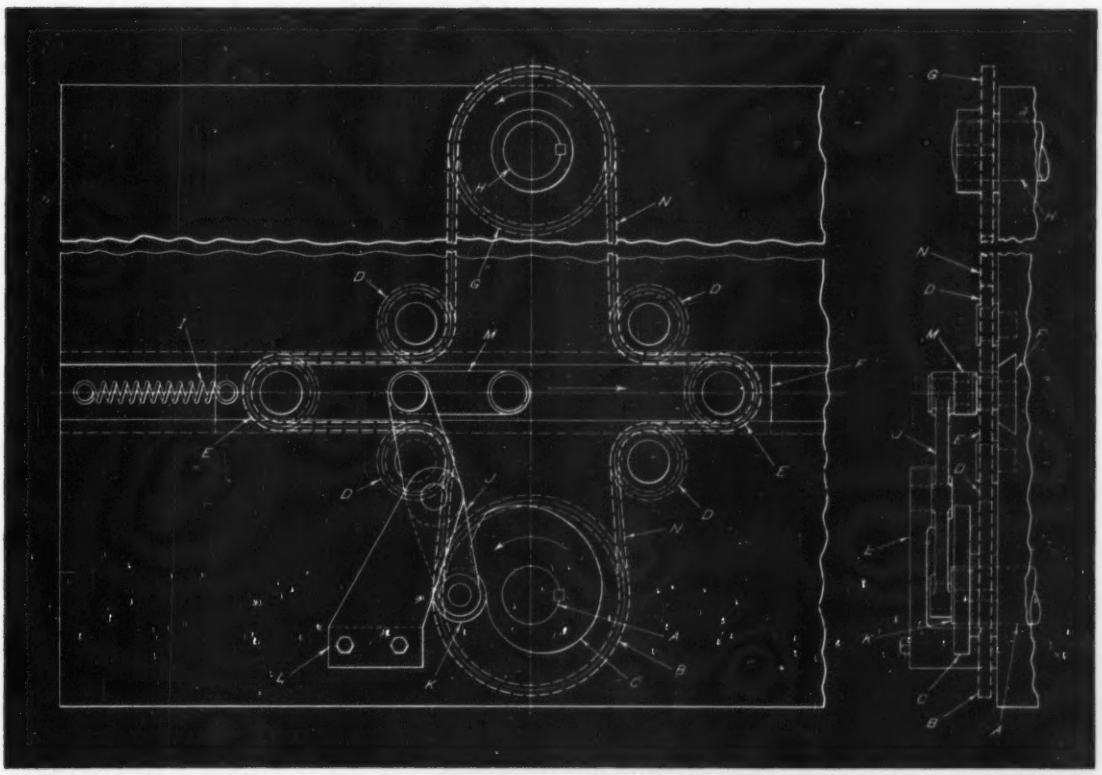
Chain-Driven Intermittent Rotary Movement

By L. KASPER

On a wire fabricating machine, a driven shaft was to be given an intermittent rotary movement through a roller chain from a uniformly rotating driving shaft. Both shafts had to begin and complete each revolution together. However, because the driven shaft was to move intermittently, it had to rotate at a higher speed than the driving shaft. The drawing illustrates the mechanism that was designed to obtain the required motion.

Keyed to the driving shaft *A* are a sprocket *B* and a cam *C*. A bracket *L* supports a lever *J*. At its lower end, lever *J* carries a follower roller *K* which, in turn, contacts the cam. The upper end of the lever is joined by a link *M* to a slide-bar *F* dovetailed to the frame of the machine. Four idler sprockets *D* are mounted on the machine, and two idler sprockets *E* are carried on the slide-bar. A spring *I* serves to resist any movement of the slide-bar to the right, and maintains the follower roller in contact with the cam. The driven shaft *H* has a sprocket *G* keyed to it which, like the sprocket on the driving shaft, is in mesh with a chain *N*.

In order to explain the operation of the mechanism, let it be assumed that the cam and lever were omitted. The rotation of shafts *A* and *H* would then be in the ratio of the number of teeth on sprockets *B* and *G*, the idler sprockets *D* serving merely to direct the chain over the



Practical design for producing intermittent rotation in a driven shaft (H) from a uniformly rotating driving shaft (A)

required path. The two idler sprockets *E* carried on the slide-bar do not affect the motion of sprocket *G*, provided the slide-bar remains stationary. But if there is a change in the position of the slide-bar, there will also be a change in the relative positions of sprockets *B* and *G*. This is because the movement of the slide-bar causes the chain to be let out on one side and taken up on the other side, this action producing a partial rotation of sprocket *G*.

By referring to the drawing, it can be seen that the cam rotates in the direction indicated by the arrow, and is about to make the lever swing on its fulcrum and move the slide-bar to the right. As a result of this action, the chain is let out on the left side and taken up on the right side. If the take-up speed is equal to the linear speed of the chain, no rotative motion will be transmitted to sprocket *G* while the slide-bar is in motion. The linear speed of the slide-bar must equal one-half the speed of the chain to produce this condition, because the chain is let out and taken up on both sides of sprockets *E*. The angle of rise of the cam must equal the angle of the dwell required in the rotation of the driven shaft. The rise of the cam must equal one-half the peripheral distance on the pitch circle of sprocket *B* during which sprocket *G* does not rotate.

In order to maintain the timing of the sprockets, sprocket *G* must be smaller than sprocket *B* by the number of teeth corresponding to the angle of the dwell required in the rotative movement of shaft *H*. For example, in this particular application a dwell of 60 degrees was required in the rotative movement of shaft *H*. Since sprocket *B* has twenty-four teeth, sprocket *G* has four teeth less $\left(\frac{60}{360} \times 24 = 4\right)$, or twenty teeth. This is necessary because four of the twenty-four teeth in sprocket *B* are used to move the slide-bar, leaving twenty teeth to rotate sprocket *G*. The rotative speed of sprocket *G* is higher than that of sprocket *B*, because the former makes a complete revolution while the latter rotates only 300 degrees. However, the time cycles of the two shafts are identical.

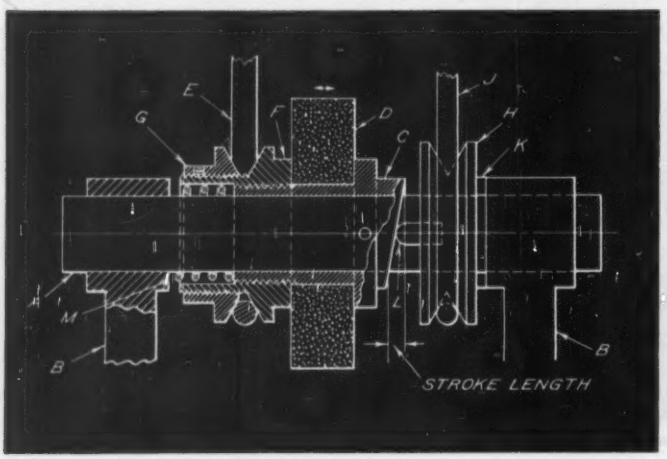
Both the rise and fall of the cam are uniform. This condition is necessary on the rise, for shaft *H* would not remain at rest during the movement of the slide-bar; and on the fall, it is necessary in order to produce a uniform rotation of shaft *H*.

Slow Reciprocation of Grinding Wheel Obtained from High-Speed Drive

By PAUL GRODZINSKI

Slow reciprocation of the abrasive wheel on a special centerless grinding machine designed by R. Shepherd, Birmingham, England, is obtained from the high-speed rotary movement without the need for a reduction gear by means of the mechanism shown in the accompanying illustration. Reciprocation is accomplished by means of an axial cam drive and an additional pulley on the grinding wheel spindle.

Grinding wheel spindle *A* can rotate and slide in adjustable bearings *B*. Sleeve *C*, on which grinding wheel *D* is mounted, is pinned to the spindle. The wheel is rotated by belt *E*, which is mounted on a split pulley (*F* and *G*). Half-pulley *F* is screwed on sleeve *C*, while adjustable member *G* is secured to *F* by set-screws. By varying the axial location of member *G*, the effective diameter of the pulley and, consequently, its speed can be changed. A second pulley *H*—this one freely mounted on the spin-



Slow reciprocation of grinding wheel (D) is obtained by an axial cam drive mechanism. Freely mounted pulley (H) must rotate at a different speed than the wheel-driving split pulley (F and G).

dle—is rotated by belt *J*. Mounted between this pulley and the right-hand bearing is a bronze washer *K*, and a pin *L* is pressed into the left-hand face of the pulley.

A helical cam surface provided on the right-hand end of sleeve *C* is kept in contact with pin *I*. by spring *M*. Belts *E* and *J* can both be driven from the same shaft, but they must rotate the split pulley (*F* and *G*) and pulley *H* at different speeds in order to reciprocate the grinding wheel. If these pulleys were rotated at the same speed, there would be no relative motion between the pin and the contact point on the cam surface. However, as soon as there is a difference in the pulley speeds, the grinding wheel is reciprocated. The rate of reciprocation depends upon the difference in pulley speeds, and the length of stroke is controlled by the rise on the cam surface, as indicated on the drawing.

Disconnecting Device for Use with a Translating Screw

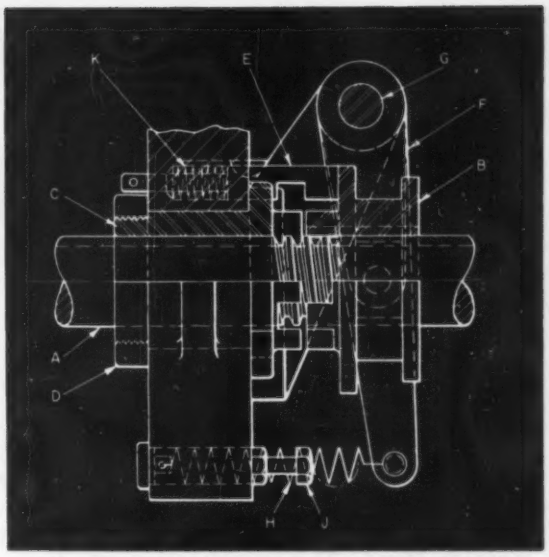
By H. B. SCHELL

One of the problems which a designer had to solve in developing a certain machine was to provide for independent positioning of several units arranged in a straight line. This positioning had to be accomplished manually. A screw was the only practical method of movement; therefore, some sort of clutch or disconnecting device seemed necessary so that each unit could be moved independently by one screw.

The device shown in the illustration was designed for this purpose. It has a translating screw *A*, on which a collar *B* is slideably keyed. Sleeve *C* is mounted in the frame of the movable unit, free to rotate, and kept from axial movement by a flange and the retaining nut *D*. A shifting yoke *F* having suitable shoes is provided, by means of which the collar *B* may be moved axially, relative to sleeve *C*. Collar *B* and sleeve*C* have engageable jaws on their adjacent faces. The shifting mechanism is mounted on suitable brackets.

In operation plunger *E* engages one of a series of semi-circular grooves, or pockets, cut through the flange of sleeve *C*. Since this plunger prevents rotation of the nut, the unit can only move laterally. The device is held in this position manually by a short hand-lever, not shown, attached to shaft *G* and, of course, it is retained in this position while the screw rotates until the unit is located as required.

Upon release of the hand-lever, the spring *H* pulls the shifting yoke *F* to the left until it engages a stop-screw *J*. In this position, the jaws of collar *B* engage those of sleeve *C*. This position will also move plunger *E* to the left a sufficient distance to disengage the flange of sleeve *C*, which can then pass through the slot provided in the plunger for that purpose. In this position the collar *B* will rotate sleeve *C*, and no lateral movement is obtained.



A disconnecting device on a translating screw by which manual intermittent motion is obtained

Spring *K* causes plunger *E* to bear against the collar *B*, and thus follow its shifting. This plunger must be held against rotation that would permit the clearance slot to move out of its proper relation with the flange of sleeve *C*. In this case, a small key was used, and the keyway had to be filed in the frame of the device. A small cotter-pin in the stem of the plunger serves to retain it in case other parts of the mechanism are disassembled.

* * *

New Films on Gas-Cutting and Welding

A motion picture which deals with the application of machine gas-cutting on steel plate and scrap has been brought out by the Air Reduction Sales Co., New York City. This film shows the oxy-acetylene torch at work in shipyards, steel mills, and various manufacturing plants. It is called "Burning Blades." A second picture produced by the same company shows aluminum welding operations on sheets from 1/8 to 1 inch thick, as well as copper and aluminum-bronze welding. This picture is entitled "Tool of Many Uses." Both of these Kodachrome sound films were exhibited for the first time at the recent Metal Show.

TOOL ENGINEERING Ideas

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Reel and Cable Used to Generate Tapers on a Lathe

By JOSE SOBKOWIAK, Jackson, Mich.

Self-holding tapers such as those in the Morse or Brown & Sharpe series can be accurately generated on a lathe equipped with the attachment shown in Fig. 1. This is a plan view of a taper-turning operation, in which the cross-slide *A* has been disengaged from the regular slide-screw nut of the lathe, and is under the direction of a reel *B*. A cable *C* wound around the reel has its two ends anchored to the headstock and tailstock ends of the lathe bed.

When the carriage *D* moves along the ways *E*, the reel is caused to revolve. In the bore of the reel is a nut engaging a lead-screw *F* bolted to the cross-slide. This nut converts the rotation of the reel to a transverse movement of the cross-slide, and thus of the cutter *G* as well. If, for example, the circumference of the reel measures 12 inches and the pitch of the lead-screw is 1/5, then in 12 inches of carriage travel the reel will complete one revolution, and the lead-screw will move the slide transversely 0.200 inch. Since the work is rotating, a taper per foot of 0.400 inch is generated. By using reels of different diameters, many other tapers can be obtained with the same set-up.

The end view, Fig. 2, has been sectioned to show the construction of the attachment. Screws *H* through the reel fix the position of the bronze nut *J*. The lead-screw *F* is threaded at its left end so that it can be bolted to the standard *K* fastened to the end of the slide. Two heavy compression springs *L* are contained over pins *M* projecting from both the standard and from a bushed backing plate *N* fastened to the rear of the carriage. The purpose of these springs is to maintain the reel against the bushing *O* as it (the reel) is unscrewed. The screw *P*, by means of which the cross-slide *A* is secured to the nut *Q* for straight turning operations, is shown removed.

The rear view, Fig. 3, shows how the cable *C* is anchored to the two posts *R*. Each post is held in a bracket *S* having a V-shaped surface which

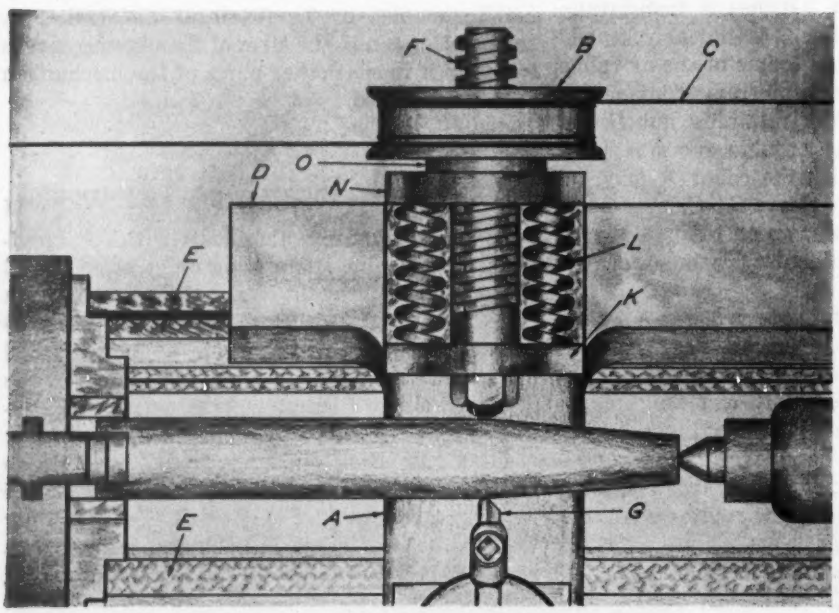


Fig. 1. For each revolution of the reel (B) the slide (A) moves transversely a distance equal to the pitch of the lead-screw (F)

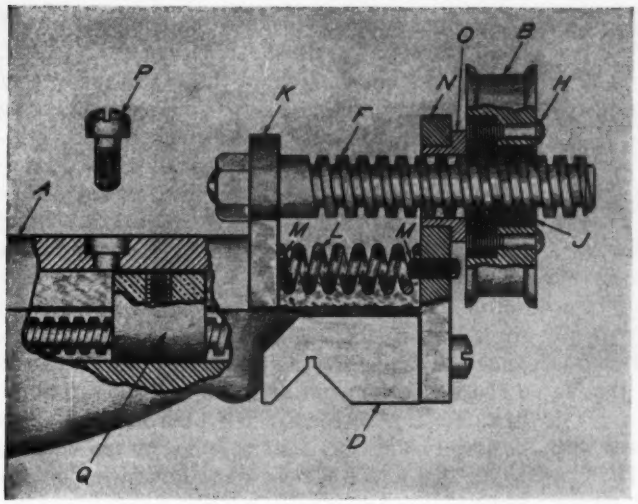


Fig. 2. (Left) When revolving in one direction, the reel automatically tightens against the bushing (O); when revolving in the opposite direction, the pressure of the spring (L) maintains the thrust of the reel against the bushing

Fig. 3. (Center) Near the top of each post (R) a small hole (U) receives the cable (C). A screwdriver can be used in the slot (V) in the top of the post to draw the cable taut. The post can be prevented from turning by tightening the set-screw (W).

Fig. 4. (Bottom) A taut wire is essential to the generation of a perfect taper. Slippage of the reel is prevented by tightening the set-screw (T).

can be clamped on the rear bedway of the lathe. The cable employed is music wire, 0.025 to 0.030 inch in diameter. It has to be carefully wound around the reel and kept taut in order to produce a perfect taper. In Fig. 4 can be seen how the cable is prevented from slipping on the reel by a set-screw *T*.

In the table below are given the reel diameters required to generate each of the Morse tapers, assuming a pitch of 1/5 for the lead-screw.

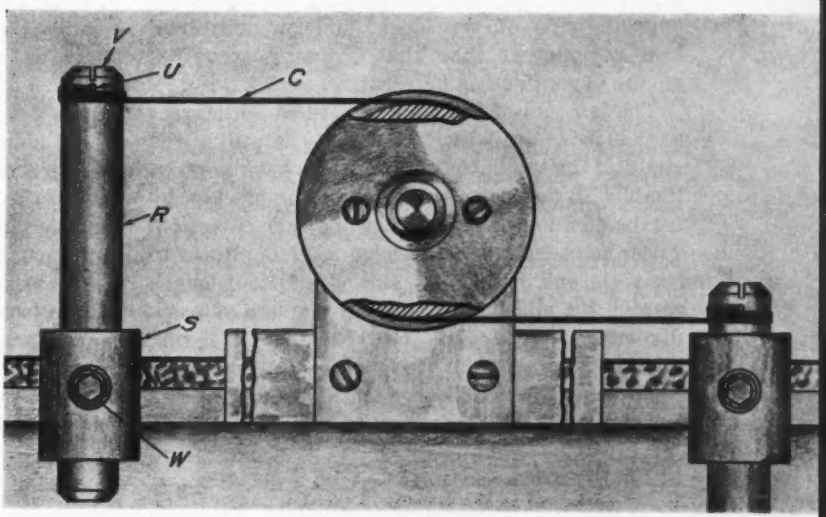
Morse Taper Number	Reel Diameter, in Inches
0	2.4446
1	2.5507
2	2.5507
3	2.5380
4	2.4523
5	2.4213
6	2.4446
7	2.4485

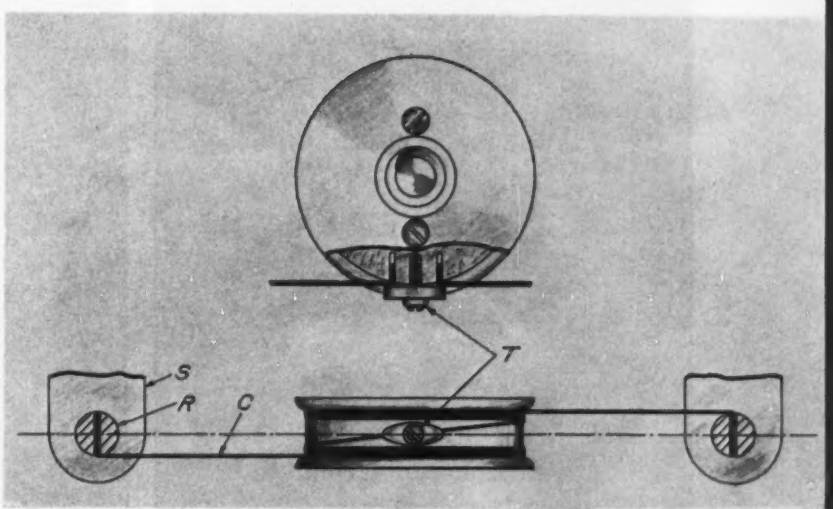
For a No. 10 Brown & Sharpe taper, the reel diameter is 2.9610 inches; for all other tapers in this series, the reel diameter is 3.0557 inches.

Another method of determining the reel diameter is to divide the constant 1.527887 by the taper per foot required. For example, the No. 3 Morse taper is 0.602 inch per foot.

Therefore

$$\frac{1.527887}{0.602} = 2.5380 \text{ inches reel diameter.}$$





V-Blocks Feature Low Head-Room Clamping

By W. M. HALLIDAY, Birkdale, Southport, England

V-blocks are commonly used for supporting round work on machine tables for such operations as drilling and light milling. One objection to the use of conventional V-blocks, however, is that the straps which secure the work in the blocks require considerable head-room. If a block must be positioned close to a cutter or an arbor, the strap may obstruct the feed movement This eventuality is eliminated in the V-block illustrated in Fig. 1.

The work *X* is secured in the 60-degree vee of the block *A* by the pressure of a slide *B*. The slide is dovetailed to one side of the block, which has been reduced in height. In this manner, the high point of the slide is level with the top of the opposite side of the block, and no additional head-room other than that ordinarily required by the block itself is necessary.

The left end of the slide is beveled 30 degrees so that it is parallel with the opposite wall of the vee, and the top of the slide inclines back approximately 10 degrees. Actuation of the block is by means of knurled nuts *C*, one for each direction. These nuts engage a threaded stud *D* pinned to the right end of the slide and of sufficient length to give the slide adjustment to a range of work diameters. Both nuts bear against a thrust bracket *E* attached to the block by cap-screws *F*. Slots *G* are provided on each side of the block for clamping it to the work-table.

Another V-block design featuring low head-room clamping is illustrated in Fig. 2. Here, the work *X* is secured in the 90-degree vee of the block *A* by the pressure of a finger *B*. Along the right side of the block is machined a right-angle step *C*. A deep curved channel *D*, extending for the greater part of the length of the block, is milled into the step. The left side of the channel is inclined slightly, and enters the right wall of the vee. A rod *E* running through both sides of the channel serves as a hinge bolt for a link *F*, the top of which is divided to receive the finger *B*. In the center of the finger is a slot *G* accommodating a pin *H* fixed across the link. As can be seen in the plan view, the link is able to be located at a point in the channel where the finger will be most effective over the work.

A lever action of the finger is instituted by turning a thumb-screw *J*. This screw engages a nut-block *K* which has a cylindrical body and which is held in a hole running transversely across a slot in the right end of the finger. When the screw is tightened down onto the top of the step *C*, the left end of the finger applies pressure on the work. When the screw is released, the nut-block can be swiveled slightly so that the end of the screw clears the step. The finger can then be lifted and the work unloaded. For work of relatively large diameter, the rod *E* can be located in a second set of holes *L* in the the channel. By so doing, the elevation of the finger above the vee is greater. The thumb-screw is made long enough to be effective in this second position of the rod.

Fig. 1. In this design, the work (X) is secured in the vee by the pressure of the slide (B).

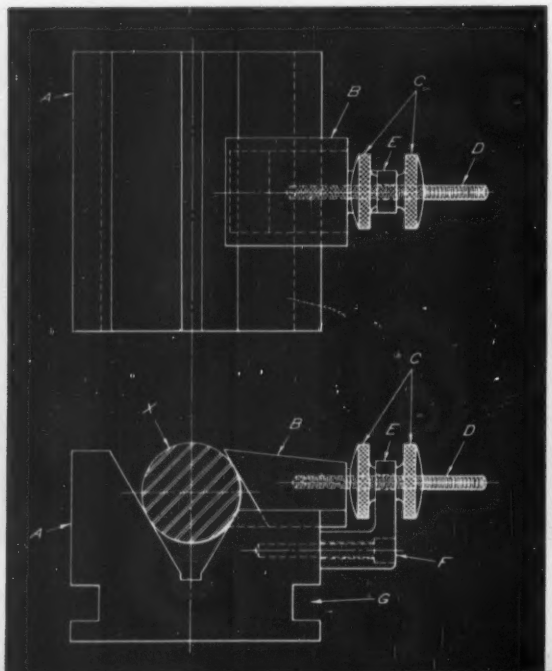
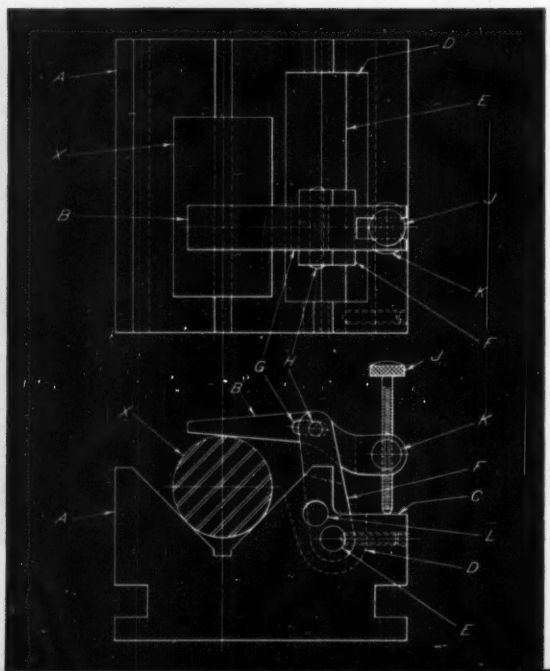


Fig. 2. Here the work (X) is secured in the vee by the leverage applied by the finger (B).



THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

Entertainment and Gifts

AT Christmas friendly human relations reach a peak of good will. Giving symbolizes good will; hence it is timely to discuss giving in the field of business—especially since one top official of a machine tool supplier has suggested that I write on this subject and since a young sales engineer has just asked me the question: "Is it necessary to entertain?"

To me entertainment is an "of course" — a necessity. But let us justify and qualify this conclusion. As long as people have emotion and sentiment (and these to some degree always mold opinion), some form of entertainment will and should be a part of business. But why mix emotion and sentiment with the dollar mark of business decision?

Let us consider a few principles that may clear fuzzy thinking on entertainment. Business connections today constitute a large share of our social life. Friendships formed through trade are often some of the best we have. The whole framework of industrial enterprise depends more and more on human relationships—between employer and worker, supplier and customer.

True gifts involve personal interest and self-sacrifice. They are messages of good will focussed upon the complex personality of the recipient. They can brighten and enrich life, or make it sordid and materialistic.

Rebellion has long been stirring among thoughtful and conscientious business officials against the insidious evils of lavish and wasteful giving. As in politics, where the "mink coat" is currently an unsavory symbol, so in business the words "graft" and "buying business" are whispered. Excessive entertainment costs have been deplored, in spite of the fact that our system of corporation taxes may tend to encourage it.

"Why do you have to entertain in a big way?" exclaims the salesman who spends his own money for entertainment. "Look what our competitors do," answers the salesman who has a company expense account. "It's just part of the business. We can't afford to be a cheap skate." And thus entertainment grows and becomes more competitive. Many a salesman has grown to enjoy it so much that he exploits the custom, knowing full well that he gives company property and in return receives gifts or entertainment that apply to him personally.

Granting that entertainment is natural and necessary, what then is sensible and justifiable entertainment? Personal opinion and ethical standards shape any reply to these questions. The following thoughts may, however, help determine upon a reasonable approach and practice in giving.

1. When we do give either our time or share of the company's pocketbook, think first of the recipient. Make the gift personal.

2. Choose remembrances that have personal meaning, encompassing our own personality and that of the recipient. In the end, the gift—to be a true gift— must include the element of fellowship with no thought of return.

3. Of all times, Christmas symbolizes good will—not bribery. How much would the ardent trout-fishing companion appreciate a few carefully selected flies, or the devotee of Italian music a few Puccini records!

4. Personal gifts should be of high quality—even though simple. Long after their receipt they should typify the giver. The memory that lingers in the mind of the recipient represents the value.

And so as we approach the good will of Christmas, we would do well to analyze our giving motives and the character of our gifts and entertainment, to bring them into line with true values in giving.

LATEST DEVELOPMENTS IN *Shop*

Gleason Rolling Quench Machine Developed to Minimize Distortion

A machine designed for holding and quenching heated shafts or parts in such a manner that they can be hardened with a minimum of distortion has been developed by the Gleason Works, 1000 University Ave., Rochester 3, N. Y. Shafts heated to the required temperature for quenching are placed on the lower rollers of this machine, as shown in the close-up view, Fig. 2. Buttons are then depressed to start the quenching cycle. From this point on, the entire operation of the rolling quench machine is automatic.

The upper roller holders shown in Fig. 3 force the parts against the lower rollers. Some of the lower rollers serve as rotating drivers, and when pressure is applied cause the shafts or parts to rotate in a quenching medium for a predetermined time. Upon completion of the quench, the guard, upper rollers, and roller brackets are raised automatically, permitting the shafts to be removed by the operator. The rollers hold the part straight and concentric while rotating it throughout the quenching operation.

An outstanding feature incorporated in this machine is a controlled force quench which assures uniform hardness, and is an important factor in keeping distortion at a minimum. The controlled pressure applied to the work by the pre-set clamping and roller pressure serves to eliminate the necessity for straightening after the parts are hardened. The quenching cycle is designed to simplify operation, save attendants' time, and assure uniform results. Multiple quenching may be employed for parts that are short in length. The standard rolling quench machine is designed for use with an oil quench, but can be used with water or caustic soda by changing a few simple parts.



Fig. 1. Machine developed by Gleason Works for uniform quenching of shafts under pressure to reduce distortion resulting from hardening

A built-in pumping system and a reservoir reduce the external supply of quenching fluid required to an average of 25 gallons per minute, while providing a flow through the quenching chamber as high as 250 gallons per minute. The quench is a continuous flow from the front of the quenching chamber to the rear, over an overflow, and back to the reservoir. As the upper roller holder and guard close, the flow is blocked and the fluid must rise to a new elevation before returning to the reservoir, submerging the part of the cycle. The flow and volume of quenching fluid on the part can easily be adjusted for the particular job.

With proper tooling, the machine will handle shafts from 9/16 inch to 4 inches in diameter, 6 to 43 inches long. Parts or shafts with gears, cams, or shoulders not exceeding 8 inches in diameter can be accommodated.

Standard equipment furnished with this machine consists of two

Equipment

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

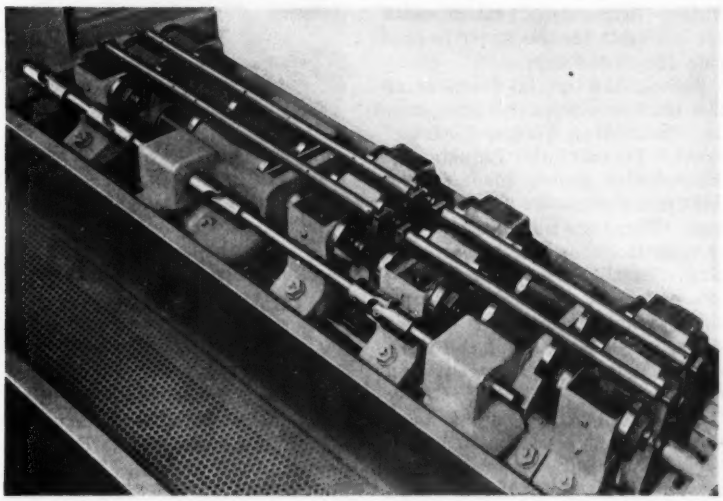


Fig. 2. Close-up view of shafts to be hardened located on rollers of quenching machine shown in Fig. 1

roller drive brackets, three idler roller brackets, and five roller pressure brackets. The roller drive brackets and the idler roller brackets are units mounted on the stationary part of the quenching chamber to hold the heated part straight while rotating in the quench. The roller drive bracket has power-driven rolls which rotate the part. The idler roller bracket is for support only, its rolls being free to turn with the part.

The pressure roller bracket units are mounted on the movable portion of the quenching chamber, and are raised and lowered with it. These units apply pressure through rollers to the upper surface of the heated part and force it into contact with the rollers on the roller drive bracket and the idler roller bracket, thus assuring that distortion will be held to a minimum.

The machine requires a floor space 94 1/2 inches wide by 58 3/4 inches deep, and has a height of 74 inches. The pump is driven by a 5-H.P. 3600-R.P.M. motor, and the roller unit by a 1 1/2-H.P. 1725-R.P.M. motor. A 3-H.P. 1725-R.P.M. motor is used for the main drive.

Benjamin Balancer for Portable Tools

A balancing unit designed for suspending portable tools weighing up to 5 pounds has been brought out by Benjamin Reel Products, Inc., 10700-10710 Broadway, Cleveland 25, Ohio. With this balancer a portable tool can be suspended over or adjacent to the working area, thus making appreciable savings in tool handling and reducing operator fatigue. A plastic ball on a cable can be easily located to permit the portable tool to be suspended at any desired height. An automatic latching arrangement which will permit the cable to be latched at the desired length when it is pulled out of the reel is available.

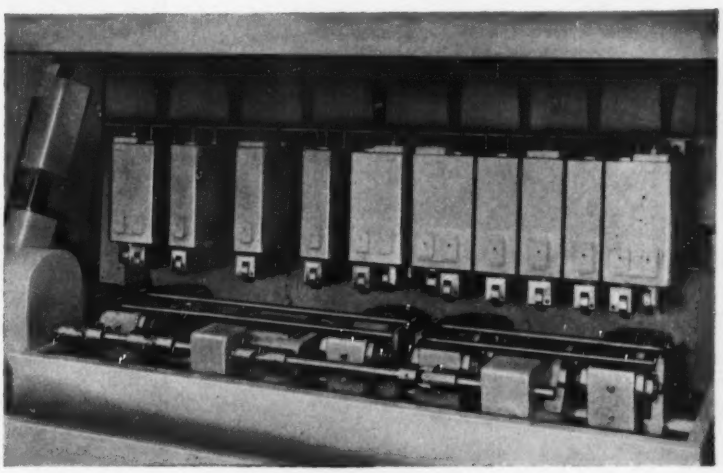


Fig. 3. View showing lower work-supporting and driving rollers and upper pressure rollers of Gleason rolling quench machine

Wheelabrator Wet-Blasting Cleaning and Finishing Machine

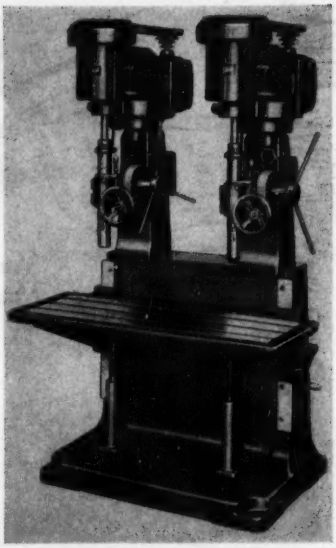
The American Wheelabrator & Equipment Corporation, 1147 S. Byrkit St., Mishawaka, Ind., has recently added a Model 64 "Liquamatte" to its line of wet-blasting machines. This machine is designed for precision cleaning and finishing of large, heavy pieces such as encountered in the manufacture and maintenance of forging, die-casting, and drawing dies and glass, plastic, and rubber molds. It is also useful in reconditioning plant engines, oil burners, etc.; cleaning jet engines after shakedown tests; surfacing tools such as long broaches, before and after plating; blending different types of finishes on aluminum; and removing scale.

The machine is 6 feet long by 6 feet 10 1/2 inches deep by 8 feet 11 inches high, and will handle single pieces or loads of pieces up to 3500 pounds in weight. It has two 49- by 36-inch counterbalanced doors and an accessory tank 6 feet long to receive the parts from the blast chamber for rinsing.

Two sets of armholes are provided, as shown in Fig. 1, so that two operators can be accommodated at once, if necessary. Otherwise one operator can occupy any one of three positions. There are three abrasive nozzles, individually controlled, ready for use at any time. Different sized jets in each nozzle provide maximum versatility. The operator stands outside the cabinet, with his arms extended through the gauntlets shown in Fig. 2, and manipulates the abrasive gun and the worktable with his hands while operating the compressed air valve with his knee. When blasting is finished, the work car is rolled onto the power rinse tank where the work is rinsed with water raised by a pump through a hose. Ferrous parts are rinsed in inhibited water. Immersion heater units are available for the water to provide for faster drying.

Among the special features of this machine are push-button controls located on a central control panel. To start the Liquamatte, the operator merely turns on the light and pushes two starting buttons. There are no valves to open or close in either starting or stopping. Small parts to be cleaned can be passed through the armholes without opening the cabinet doors. A clear view of the work is available through large vision windows.

An "Abrasostat" is available which tells at a glance the number of blasting hours that the abrasive has been in the machine. It lets the operator know when to change the abrasive, making it easier to avoid abrasive waste.



Two-spindle versatile drilling machine brought out by Sibley Machine & Foundry Corporation

Two-Spindle Drilling Machine of Improved Design

An improved two-spindle, 20-inch swing, Model MC-20 drilling machine has just been announced by the Sibley Machine & Foundry Corporation, 206 E. Tutt St., South Bend 23, Ind. This machine has a much sturdier column and a heavier base than preceding models. It is designed to provide

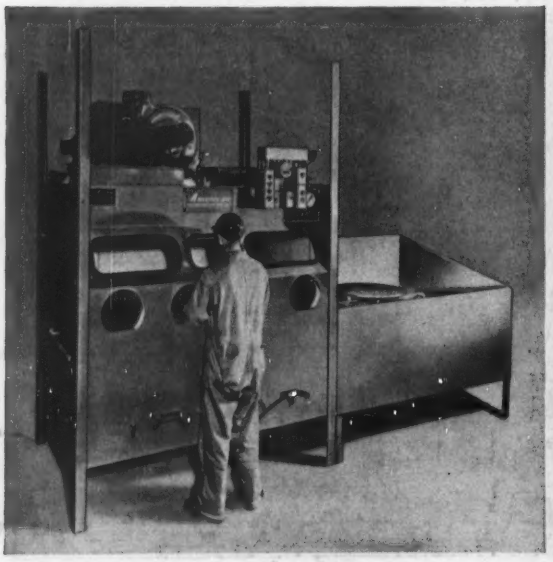


Fig. 1. Wet-blasting machine announced by the American Wheelabrator & Equipment Corporation

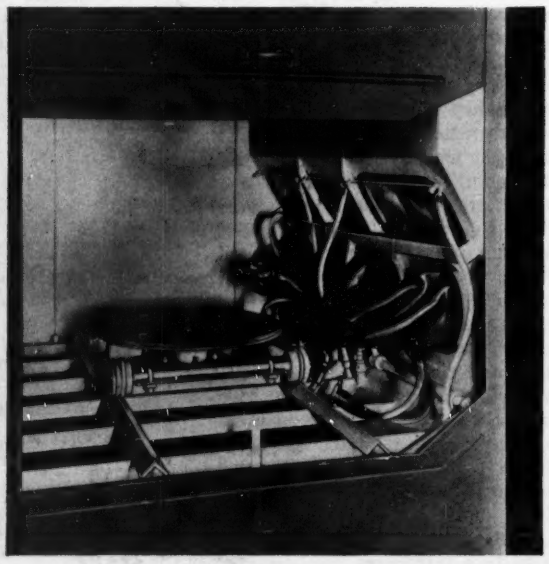


Fig. 2. View inside blasting compartment of "Liquamatte" machine shown in Fig. 1

the rigidity required for drilling 1 1/4- inch holes in mild steel. This, coupled with the machine's sensitivity for drilling small-size holes, recommends it for a variety of production drilling jobs.

A dial indicator for easy selection of geared power feeds serves to step up operator efficiency, and a spring-loaded lever for changing the eight spindle speeds of 65 to 1360 R.P.M. cuts operator time.

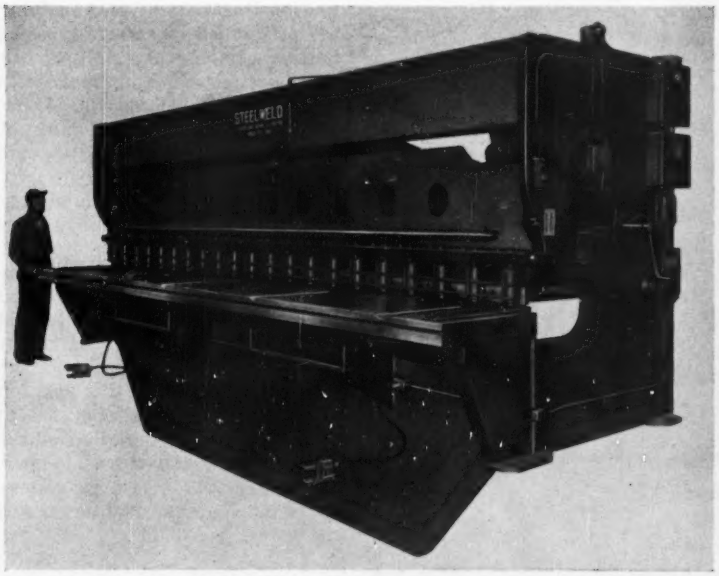
Steelweld Shear with Long Cutting Capacity

A Series 3C20 Steelweld shear recently built by the Cleveland Crane & Engineering Co., 5435 E. 282nd St., Wickliffe, Ohio, has a capacity for shearing 20 feet of 3/16-inch steel plate. This shear, said to be the longest machine of this type ever constructed, employs the pivoted-blade shearing principle in which the blade travels in a circular path without using guides and slides such as commonly employed with guillotine type shears.

The machine is operated by either of two electric foot-switches which can be moved about conveniently. The switch not in use can be locked out of the circuit. If two men are working at the shear, the switches can be so arranged by a key-operated control lock that both must be depressed simultaneously to start the cutting action.

A clutch-brake mechanism of new design makes possible greater shearing output than previously available, and permits feeding the material at the maximum machine speed of fifty-five strokes per minute. The mechanism is operated by air, providing quick, positive clutching or braking with very little slippage.

The back gage is motor-driven with control buttons located at the middle front. Just below these buttons is the indicator, visible through an oblong slot in the hold-down beam. A chain-driven rotary limit-switch stops the knife at the top of the stroke. Knife clearance can be easily adjusted to suit the thickness of metal being cut by turning a hand crank and observing a dial indicator. When the desired plate thickness is indicated, the machine is ready to cut.



Steelweld shear with long shearing capacity made by Cleveland Crane & Engineering Co.

Flask Type Motor-Driven Tumbling Barrel

A flask type tilting tumbling barrel with direct motor drive has been developed by the Hupp Corporation, Globe Division, 1250 W. 76th St., Cleveland 2, Ohio, for deburring and burnishing of precision parts, both ferrous and non-ferrous. This tumbling barrel can be employed with all types of deburring and burnishing media, and is available in sizes for loads ranging up to 750 pounds. The flask type barrel is constructed of continuous welded sections of heavy steel plate. A 1/4-inch lining of abrasion-resistant rubber or neoprene vulcanized to the barrel provides effective insulation, giving longer life to the barrel shell while protecting parts against nicking and scratching. Use of the lining permits the barrel to be employed interchangeably for deburring and burnishing.



Motor-driven tumbling barrel developed by Hupp Corporation

The drive is provided by a 1-H.P. motor mounted directly above the worm segment. The units are available with either single- or variable-speed motors which drive the barrel through a gear reduction that permits maximum power delivery to the barrel without overtaxing the motor. The tilting angle of the barrel may be adjusted to produce a smooth, tumbling action or a more violent one.

Sub-Zero Chilling Chambers for Small Parts

The introduction of a new series of chilling chambers has been announced by the Sub-Zero Products Co., Cincinnati 29, Ohio. This series, designated XV-120, is designed to obtain temperatures of 140 degrees below zero for small-scale production chilling.

Various sizes of chilling cham-

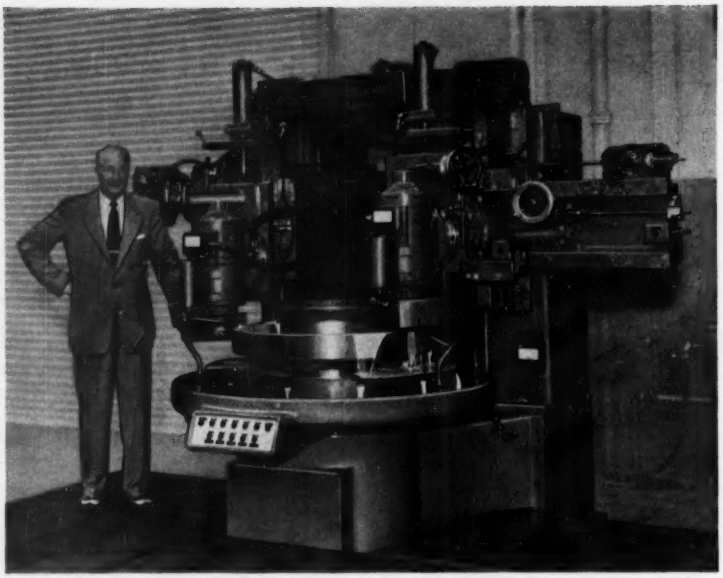
bers are available from 1.5 to 3 cubic feet. The controlled temperature range is from —70 to —140 degrees F. Heat absorption capacity is 250 B.T.U. per hour at —120 degrees F., normal operating temperature.

Applications for which these chilling chambers are already being used include stabilization of small precision parts, balls, and bearings, the treating and hardening of small amounts of tools, shrink-fitting, and production testing of small parts, such as close-tolerance resistors. The interior wall of the chilling chamber is 3/16-inch heavy gage steel. Two hermetically sealed motor-compressor assemblies of 1/4 H.P. and 1/3 H.P. are used.

Frauenthal Machines Built to Grind Bearings for Patton Tanks

The first of a new line of 48-inch grinders built by the Frauenthal Division, Kaydon Engineering Corporation, Muskegon, Mich., has been shipped to the Ford Motor Co.'s tank plant at Livonia, Mich., where five of these super precision machines will be used to grind cupola bearings for the new Patton M-48 medium tanks.

This grinder, known as the "1800 Series," has table sizes ranging from 30 to 48 inches in diameter with a swing of 56 inches, and is intended as a companion line to the 2000 and 2200 series Frauenthal grinders with tables ranging from 60 to 140 inches in diameter. All machines in this line are built to grind parts having a maximum variation in wall thickness of not more than 0.0002 inch, and faces that are parallel within 0.0002 inch.

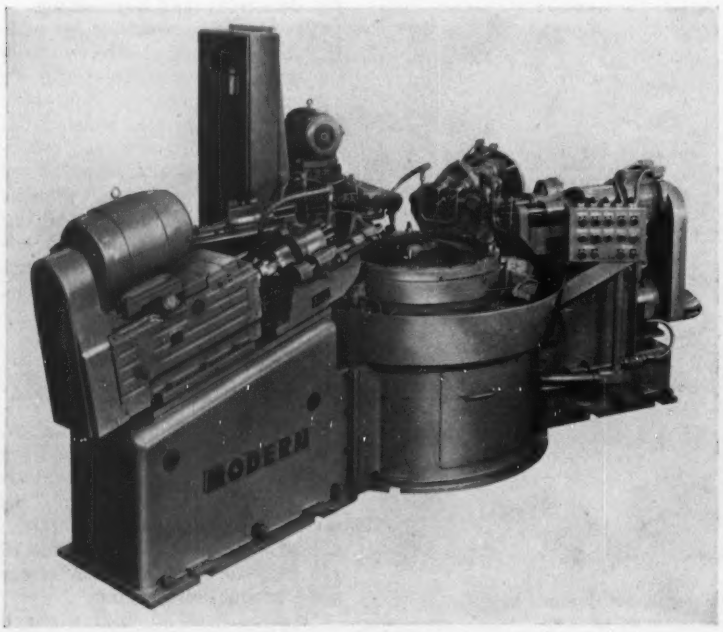


Machine built by Frauenthal Division, Kaydon Engineering Corporation, for grinding tank parts

Five-Way Drilling and Tapping Machine for Jet-Engine Housings

Development of a five-way drilling machine for jet-engine housings has been announced by the Modern Industrial Engineering Co., 14230 Birwood, Detroit 4, Mich. This machine has interchangeable multiple drill heads on two of its five stations, enabling the production of several types of housings having a variety of bolt circle specifications on faces with identical radial locations. Loading, clamping, and indexing of the housings in the fixture are done manually.

In operation, the aluminum-alloy jet-engine housings are loaded in the fixture where they are accurately located. The fixture is rotated clockwise by hand to positions where individual hold-down clamps can be tightened. After clamping, the fixture is brought to the starting position and the index lever operated to lock it in place. Actuation of the index lever causes three air-operated index-table hold-down clamps to be applied. A counter and a



Machine for drilling and tapping jet-engine housings announced by Modern Industrial Engineering Co.

circuit for predetermined automatic selection of head combinations are then set by push-button.

Indexing between operations is done manually by rotating the table after the index-pin and clamping cylinders have been automatically released by the return stroke of the heads. The table is designed so that it can be indexed in a clockwise direction only, and it cannot be indexed past successive stations. Eight stations and nine operations complete the multiple drilling and tapping of holes in the housing.

At the end of the cycle, the fixture is free to be rotated to permit unclamping and unloading the work. If tool breakage should occur during the cycle, a manual-automatic switch can be operated, causing the work to be jogged through successive positions with feeds for the heads disengaged. An emergency return button is provided to return all heads to their idle positions. The machine is powered by 3- and 5-H.P. motors, is 15 feet wide, 8 feet deep, 5 1/2 feet high, and weighs 28,000 pounds.

Lapointe Broaching Machine Developed to Meet Future Needs

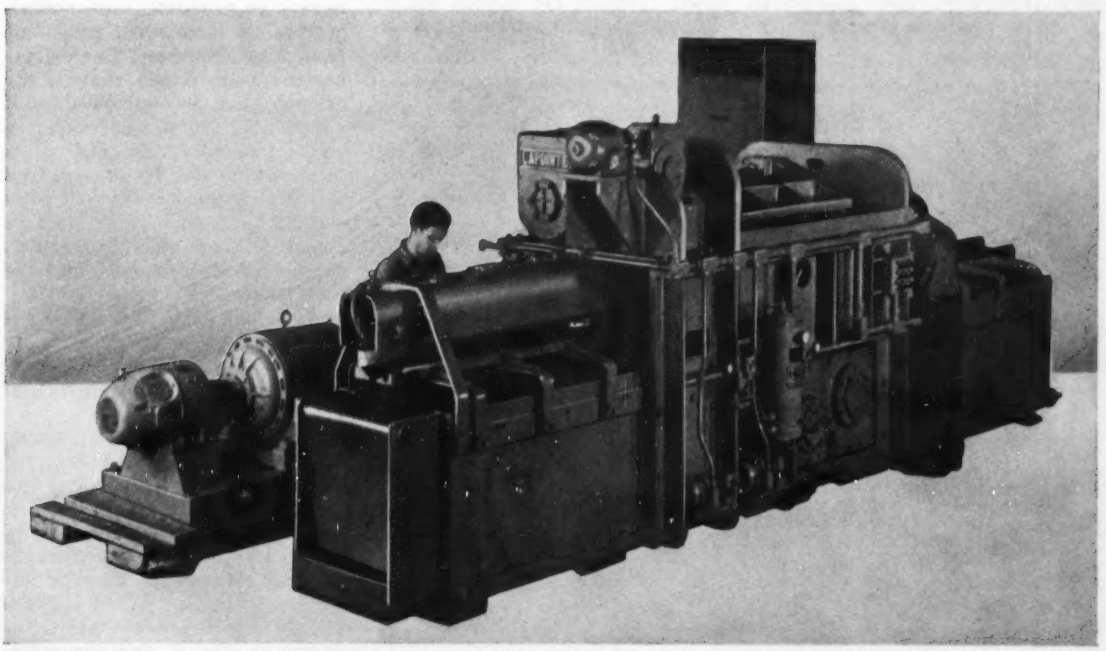
To meet "tomorrow's demand," the Lapointe Machine Tool Co., Hudson, Mass., has designed a new mechanically driven horizontal broaching machine. An important feature of this machine is its operating speed—it will broach at a speed of 150 feet per minute or more, to remove a large amount of material in the shortest possible time. It is rugged, heavy, and rigid, and can be equipped with drives up to 200 H.P. for high-speed broaching. Developed originally for the broaching of anchor slots in compressor rotor discs and turbine wheels for jet engines, at cutting speeds below 50 feet per minute, this machine can be used to advantage in the automotive or other industries for broaching at speeds in excess of 150 feet per minute.

New alloys are appearing every day. Some of them can be broached at low speeds while others are best handled at higher speeds. With this flexible machine it is now possible to determine the best speed at which to cut these materials to obtain the desired finish, with the greatest tool life.

The machine is available with strokes ranging from 66 to 200 inches, and is built around a special type of electric drive which has been developed to give the unit exceptional flexibility. Driving is through a herringbone rack, bull gear, gear reducer, and direct-current motor. The motor is fed by its own power unit of the necessary capacity to give the machine its wide range of broaching speeds. The main slide and all other sliding members subject to scoring are lined with natural phenolic plates which slide on heat-treated accurately finished Meehanite ways.

Indexing equipment of the type used in machining discs and wheels for jet type engines can be mounted on the reciprocating table. A table similar to the Lapointe Tip-Down table can be furnished for broaching jet blades. Hydraulic power is used to operate the clamping fixture.

The machine has dual speed operation available through its control panel, a means to operate at any speed for any part of the stroke, and at any other speed for the remainder of the stroke when required. The roughing section of the broach can be set to produce its work automatically, going all around the wheel at high speed. After the last roughing cut, the machine will pass only the finishing section of the broach around the wheel to complete the finishing of the slots to the required accuracy.



Broaching machine developed by the Lapointe Machine Tool Co.

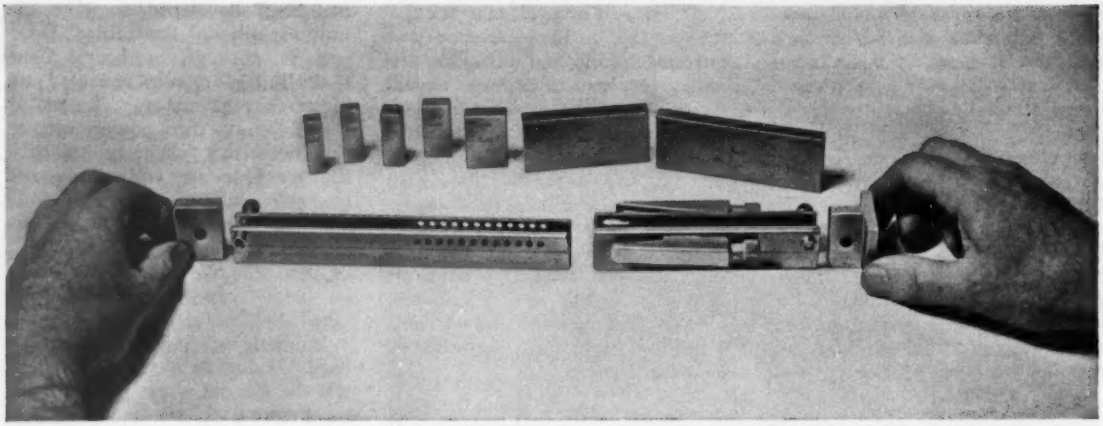


Fig. 1. End standards, channel extension, base holder, and gage-blocks of DoAll "Micro-Step" system which can be assembled to provide accurate height gage

DoAll "Micro-Step" Gage-Block System

Direct use of gage-blocks for everyday gaging operations has been limited by the mechanical difficulties involved in assembling them into practical measuring tools for specific measuring jobs. To overcome these difficulties, a "Micro-Step" system incorporating an unusual series of gaging accessories or items has been developed by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. In addition to speeding up the construction of gaging set-ups with U.S.A. type gage-blocks, these accessories, some of which are here illustrated, also provide a means for realizing greater utility from gage-blocks by permitting the construction of instruments for a wide range of gaging or scribing operations. While these accessories will be available separately, each is designed to augment the others. Together, the entire series of accessories constitutes, essentially, a complete gaging system.

The nucleus of the "Micro-Step" gaging system is the series of accessories which includes gage-block holders and "end standards" such as shown in Fig. 1. A set of holders, available in a range of sizes, provides for set-ups up to 72 inches long in increments of as little as 0.000025 inch (25 millionths). Longer set-ups can be constructed simply by assembling additional holders. The so-called "end standards" shown in Fig. 2 may be considered as functional gage-blocks. They provide working instruments having dimensions within known gage-block tolerances. The advantages of the system are the ease with which the holders, end standards, and gage-blocks can be assembled, and the uninterrupted surfaces presented by the end standards beyond the ends of the holders.

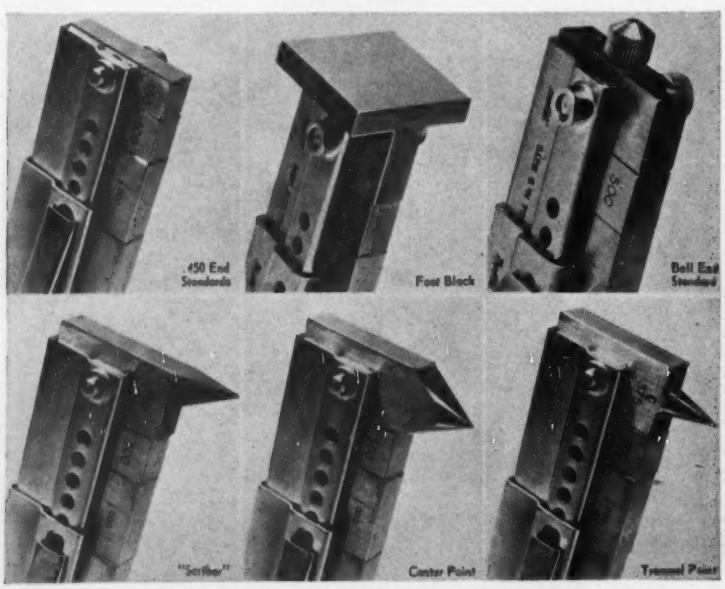


Fig. 2. Some of the end standards (functional gage-blocks) of the system

The holders of the system consist of channel type gage-block retainers in graduated sizes which provide a measuring range of from 2 to 72 inches. One caliper holder (1- to 6-inch range), for example, can be assembled with gage-blocks for use as inside or outside calipers, dividers, or a scribing compass. A channel type retainer or holder consists of a channel extension and a base holder. To form a complete holder, the extension is slipped into the base holder.

Assembling of the gages is facilitated by a detent pin arrangement at each end of every extension and base holder, and holes in the end standards which fit these pins. In attaching an end standard, it is simply inserted in the holder at the desired end and quickly locked in place by the detent pin. The gage-blocks required to complete the desired dimension between the working surfaces of the end standards are simply slipped into the holder, as shown in Fig. 1, and the entire assembly clamped together with

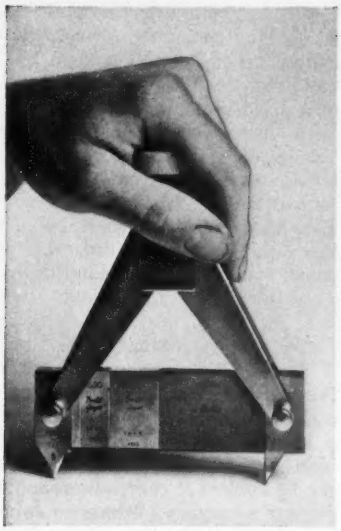


Fig. 3. Unique caliper of gage-block holder type available in set of gaging equipment

the thumb-screw mechanisms at the sides of the holder.

End standards designed to provide for a wide variety of gaging operations include a T-shaped block with platform which can be used as a firm base for constructing gages up to 25 inches in length; ball-end standards incorporating long-wearing, sapphire ball points for use in checking deep bore diameters; knife-edge caliper bars for checking concentricity of bores, etc.; and a "precalibrated" dial indicator set, consisting of a dial indicator, calibrating blocks, and brackets.

The caliper holder shown in Fig. 3 has detent pins for holding standards such as caliper bars, ball, trammel or scriber points, the dial indicator, etc. The required gage-blocks are placed between the mounted end standards, and the caliper arms are drawn together by turning a knob at the top of the caliper.

A book is provided which contains a heat-expansion calculator and height-combination tables for assembling gage-blocks. The book also gives the corrections that must be made in checking parts other than steel.

Gage-blocks with vernier markings permitting measurements in increments of 0.000010 inch (10 millionths) are also available. A "visible scale" is part of the series of "optical" gaging items which includes optical flats (1 inch to 10 inches in diameter). The visible scale is an adjustable grid which simplifies the reading of a pattern produced by interference bands.

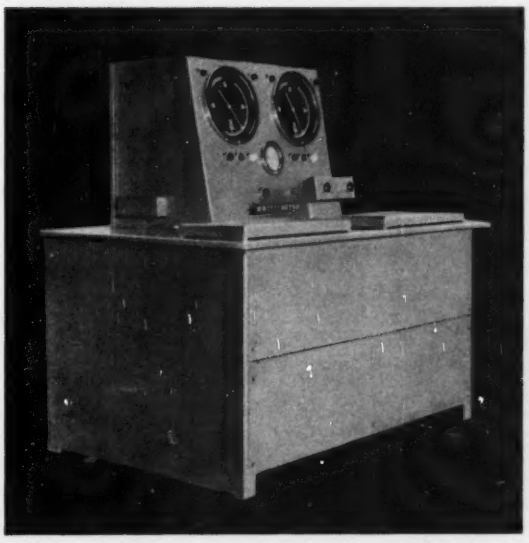
Production Line Vacuum Tester

The testing of castings, housings, seals, and similar parts for leaks by a vacuum tester brought out by the Whittington Pump & Engineering Corporation, 1126 Prospect St., Indianapolis 3, Ind., is said to be accomplished in about one-third the time required by previous methods. Submersion is also eliminated, and considerably less sealing pressure is required. The unit, it is claimed, tests a broad range of parts with no danger of causing distortion or corrosion. Other applications have been in the testing of completely assembled units, flow testing for obstructions in drilled passageways, and checking of engine valves for correct seating.

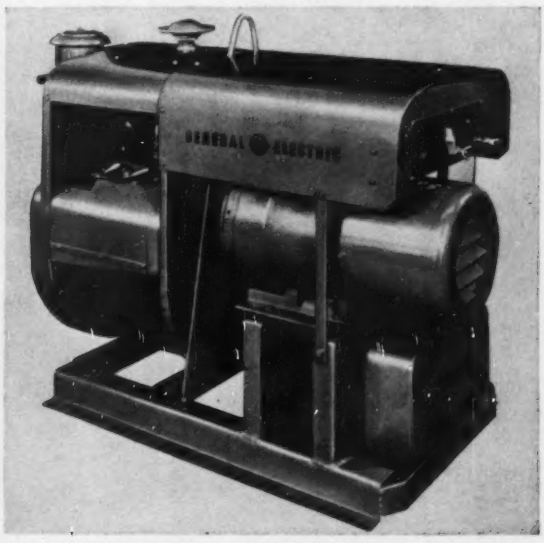
The testing machine is designed for permanent installation, and comprises a vacuum pump, automatic (electronic) controls, and large supersensitive leak-detecting instrument. Parts are firmly held to sealing pads by atmospheric pressure, the pads being specifically designed to fit the part being tested. Test machines are available in automatic, semi-automatic, and manual models.

G-E Engine-Driven Arc Welder

A new 200-ampere, engine-driven direct-current arc welder with a 60 per cent duty cycle has been announced by the General Electric Co., Schenectady 5, N. Y. This Type WD-42AGW welder has a current range of from 40 to 250 amperes, and can be used with a variety of electrode sizes for repair, maintenance, and construction work. It consists basically of a G-E Type WD42 generator and a Wisconsin air-cooled engine ar-



Vacuum type tester for detecting leaks in castings made by Whittington Pump & Engineering Corporation



Engine-driven direct-current arc welder being placed on the market by the General Electric Co.

ranged to fit crosswise in a standard pick-up truck. Optional equipment includes a trailer with fittings for pressure lubrication.

Forced ventilation keeps internal temperature within safety limits when the welder is operated on a 60 per cent duty cycle at rated load. In addition, tests indicate that heavy overloads for short periods do not produce harmful results.

Since the engine is air-cooled, coolants or anti-freeze solutions are not required. A vacuum type device saves gasoline by idling the engine when a welding operation is not being performed.

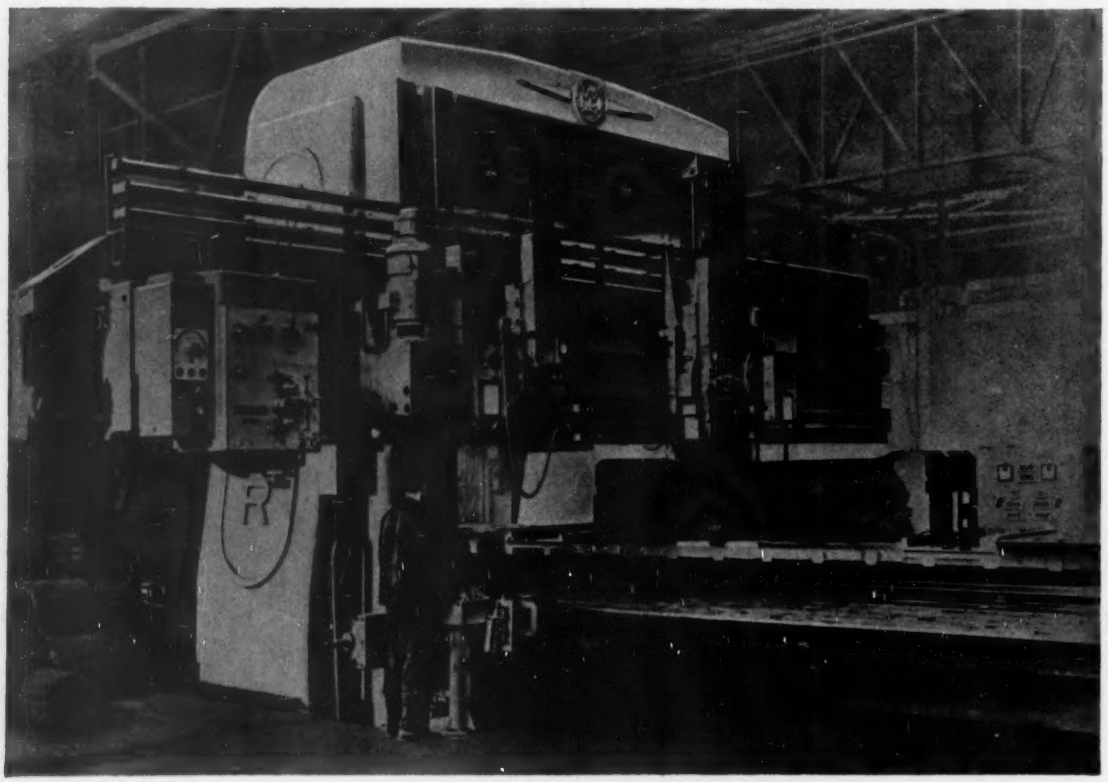
Double-Column Planer Adaptable to a Wide Variety of Planing, Slotting, and Milling Operations on Large Work

Transverse, vertical, bevel, and longitudinal planing operations can all be performed in the toolroom with a single set-up on workpieces as large as 177 inches wide by 110 inches high by 394 inches long, through the use of the Wagner double-column planer now being distributed in this country by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. Other operations possible with the same set-up include vertical and bevel slotting, and longitudinal and transverse milling.

The adaptability of this planer to such a wide variety of machining operations without realignment of the work-piece serves to reduce the costs of setting up heavy, bulky pieces as in the machining of large dies for forming aircraft parts. On this Wagner planer, the left-hand cross-rail head has an infinitely variable drive for feeding it along the cross-rail, permitting transverse planing with the original set-up.

The table is divided longitudinally into two sections with independent travel. While one piece is being machined on the section of the table under the cross-rail, a second piece can be set up on the stationary section of the table. All motions are push-button controlled from a central point. Provision is also made, by patented electromagnetic - mechanical devices, for portable push-button control of horizontal and vertical motions of feed, rapid traverse, and precision approach (the last with movements as short as 0.0004 inch). These portable controls permit easy setting from the immediate vicinity of the work. Tool-heads on the cross-rail and the side column have independent power drives. Illuminated windows with arrows, showing direction of feed, permit checking movements from a distance.

The bedways are ground, after the bed has been set up, by a special process which is said to give a guaranteed tolerance of 0.001 inch per 80 feet. This process can be applied if regrinding should become necessary. Since no spindles or feed shafts are used in driving the cross-rail and heads, a more compact design of columns and rails is possible. Heads are brought into a more favorable position from the standpoint of stresses and torsions. This construction also permits easy removal and replacement of heads in the change-over from planing to milling or grinding operations.



Double-column planer introduced in this country by Kurt Orban Co., Inc.



Carboloy "You-Try-It" kit of permanent magnets

Sample Kit of Permanent Magnets

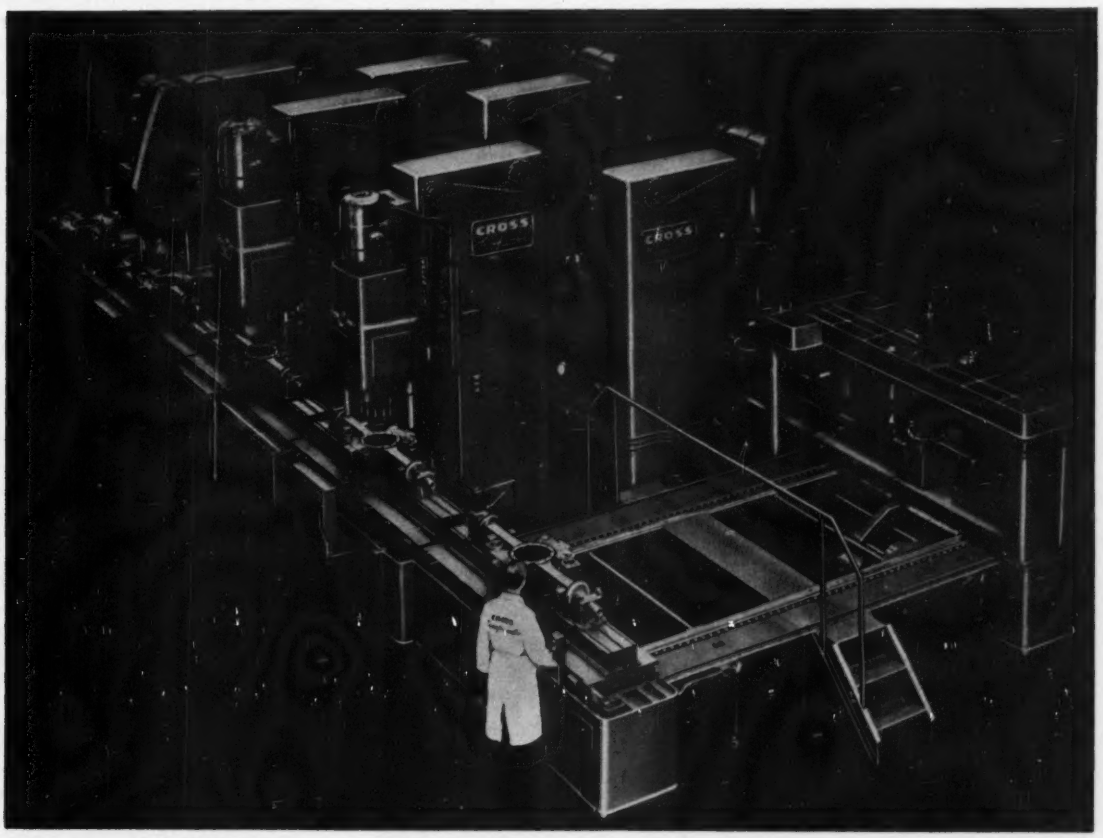
A "You-Try-It" kit of permanent magnets now being marketed by the Carboloy Department of General Electric Co., Detroit 32, Mich., is designed to enable industrial planners to devise their own new uses for permanent magnets. Carboloy permanent magnets have already found a wide use in such various applications as recovering tools from liquid tanks, feeding sheet metal into presses and holding steel plates.

Two kits are available. One kit contains forty-eight Carboloy permanent magnets in eight styles having up to 2 pounds of "pull" per unit. The other kit contains eighteen magnets, in four styles with "pulls" of 3 to 12 pounds.

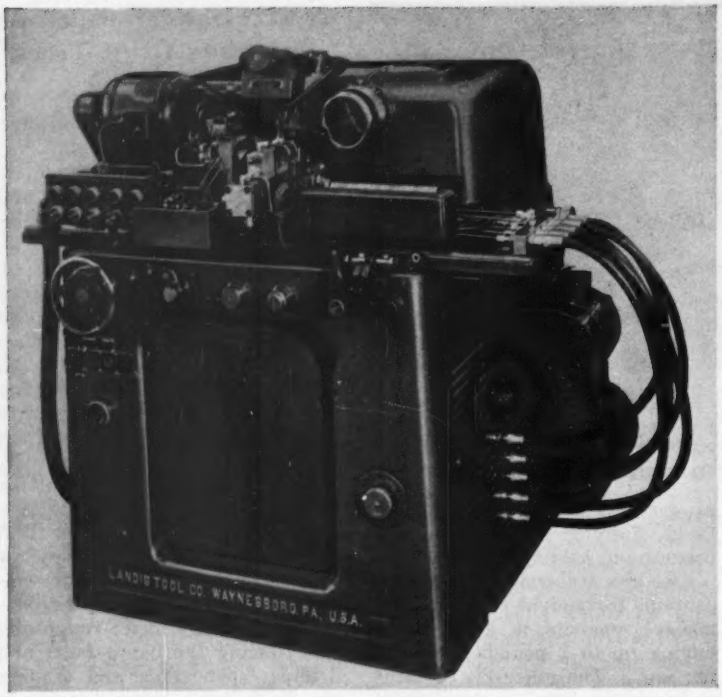
Cross "Transfer-matic" for Processing Giant Truck Axle Housings

Giant truck axle housings, which are difficult to handle during manufacturing operations, are moved easily from station to station on a new Transfer-matic recently built by The Cross Company, Detroit 7, Mich. Rapid, easy handling of this large work is accomplished by using palletized fixtures which hold the irregular-shaped parts securely during all operations, and by employing automatic transfer mechanisms to move the fixtures and parts from one station to the next.

The machine has eight stations —one for loading, one for "targeting," and six for machining. Two unskilled operators can produce thirty-five housings per hour. Operations include rough- and finish-boring the banjo hole; rough and finish-facing the banjo face; and drilling, spot-facing and tapping the drain hole. Pre-set tools are used to reduce "down" time.



"Transfer-matic" built by The Cross Company for handling giant size axle housings



Landis concentric grinder for precision grinding of bearing raceways

Landis Automatic Concentric Grinder

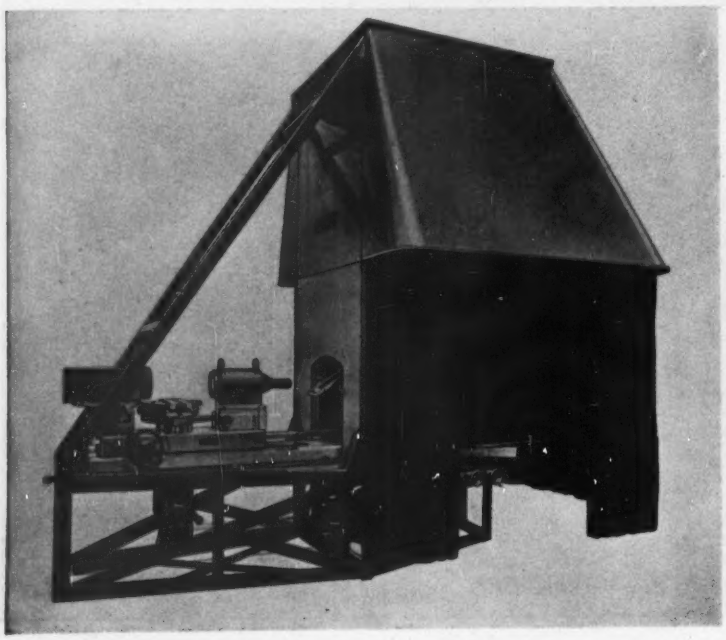
Work such as anti-friction bearing races or rings for precision mechanisms can be ground to a specified outside diameter within extremely close limits of concentricity with the bore on a grinder brought out by the Landis Tool Co., Waynesboro, Pa. This is made possible by a new method of work-holding developed by Landis engineers and incorporated in the concentric grinder.

The 4-inch machine is said to reduce a large amount of the out-of-roundness which may be present in the bore, and finish the outer surface to closer limits than the bore with respect to roundness. When grinding grooves or raceways, parallelism with the face is also assured within very close limits because of the work-holding and driving method.

The grinding wheel is 16 inches in diameter and is driven from a 3-H.P. motor. Landis "Microsphere" spindle bearings are used in both the wheel-head and work-head. Hydraulic rapid infeed and continuous hydraulic slow grinding feed are used to position and feed the wheel.

The new work-holding principle utilizes a revolving faceplate which is a permanent magnet. The work-piece revolves about an arbor which has two wear-resistant strips set in it lengthwise. In operation, the work-arbor is moved to a position at the side of, and near the center of the revolving faceplate. The two strips are spaced above and below the horizontal center line on the side of the bore nearest the grinding wheel. In effect, an internal vee type support is provided.

An automatic loader is available which loads and unloads the work-arbor, and also moves it into and away from grinding position.



Taylor-Hobson profile projector with 60-inch screen

Contour Projector with 60-Inch Screen

The Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill., has announced that it is making available a Taylor-Hobson 200-inch profile projector which has two sets of precision optical systems and a horizontal screen or viewing table 60 inches in diameter. Tracings or templates can be mounted conveniently on the viewing table under which remote controls for all adjustments are provided. The optical equipment will give 20X to 100X magnification for work up to 3 inches in diameter. For work up to 6 inches in diameter a magnification of 10X is also available.

This unit is adaptable for use in the automotive, aircraft, ball bearing and cutting tool industries. It is especially well suited for handling jet-engine components and tools for jet-engine manufacture.

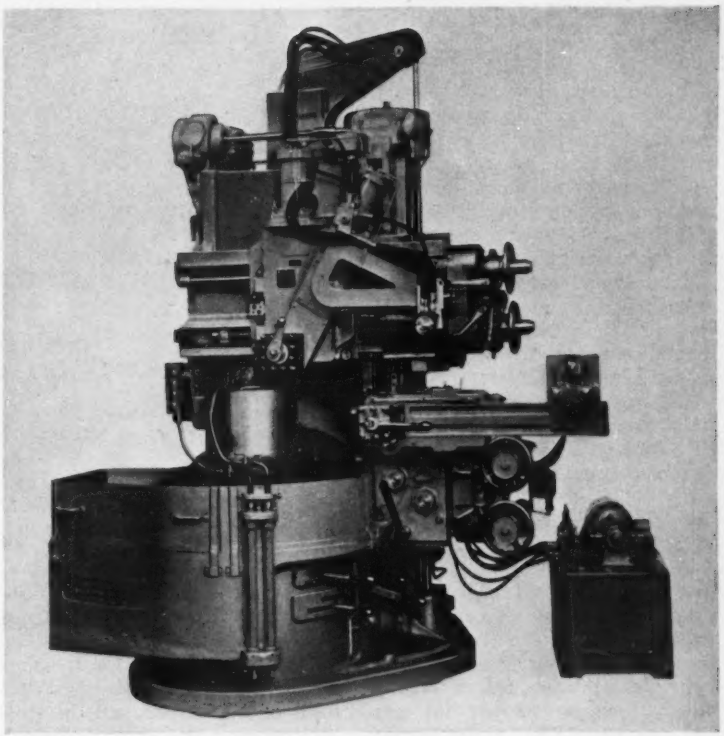
Turchan Vertical Slide Hydraulic Duplicating Attachment

A development of particular interest to manufacturers of jet-engine parts is the Turchan vertical slide hydraulic duplicating attachment shown in the illustration applied to a Niles 42- to 50-inch side head lathe. This combination increases the contouring capacity of the machine so that it can do contour-turning of greater height, as well as deeper contour-boring. The attachment is a product of the Turchan Follower Machine Co., 8259 Livernois, Detroit 4, Mich., and the lathe is built by the Niles Tool Works, Division of Lima-Baldwin-Hamilton Corporation, Hamilton, Ohio.

The vertical slide, powered by a hydraulic cylinder and operated from a control panel, gives infinitely variable feed rates and rapid travel. The cutting tool is moved to produce the desired shapes on the work by means of the hydraulic cylinder controlled by the contour follower valve in contact with the template. Micrometer adjustments permit accurate positioning of contours on the work-piece.

A four-way turret tool-block allows rough and finish cuts to be taken without changing the adjustment of the contour follower. Grooving tools can also be used with the vertical slide.

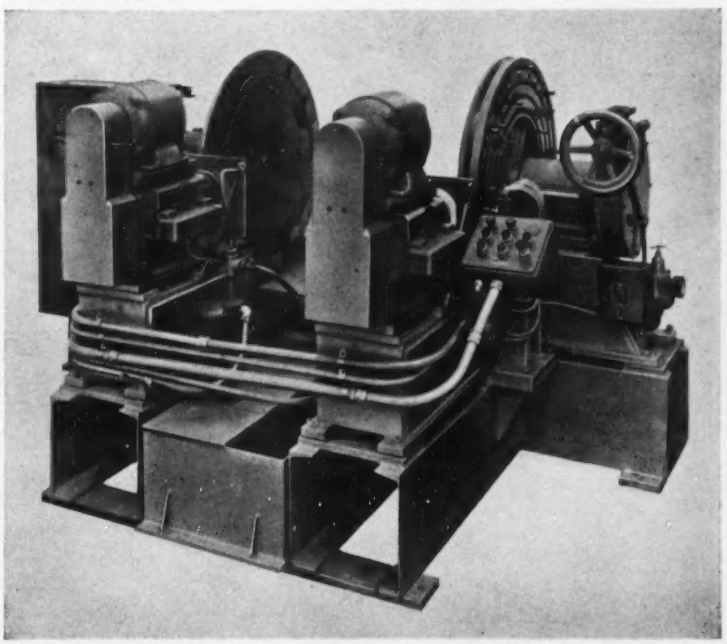
The range of parts that can be produced rapidly within accuracy limits of plus or minus 0.001 inch include jet-engine wheels, compressor discs, shroud rings, impellers, and other circular components. Many contours not ordinarily capable of being developed can be duplicated rapidly through this vertical slide movement. Although the attachment is shown integral with the Niles side-head vertical lathe, it can be fitted to any make of standard machine.



Niles side-head lathe equipped with Turchan hydraulic duplicating attachment

Milling Machine Built for Facing Operations on Jet-Engine Housings

A special milling machine has been designed and built by the Pioneer Tool & Engineering Co., 3914-18 W. Shakespeare Ave., Chicago 47, Ill., expressly for milling the inside flange faces on jet-engine housings. Features of this machine include automatic air cylinders for clamping the housings against holding faces and milling heads which oscillate in and out six times during the machining process in order to clear outside ribs.

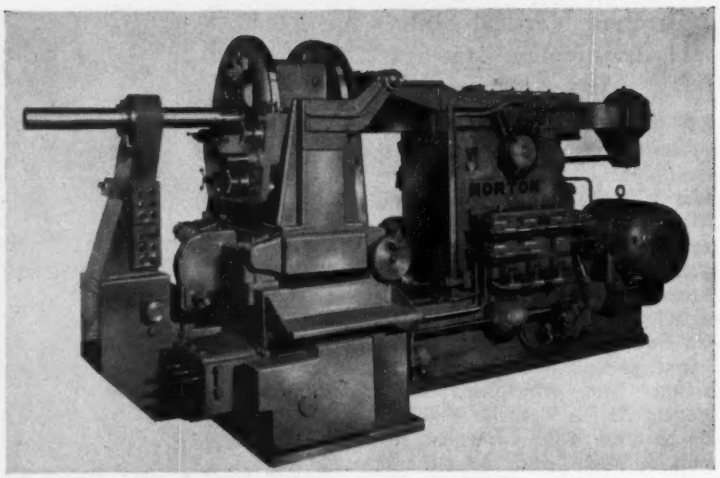


Machine brought out by the Pioneer Tool & Engineering Co., for rapid milling operations on jet-engine housings

Morton Special Hydraulic Draw-Cut Shaper

A draw-cut shaper especially designed for machining the rectangular tapered openings in cast or forged steel breech-rings in sizes from 76 to 155 millimeters has been developed by the Morton Mfg. Co., Broadway and Hoyt, Muskegon Heights, Mich.

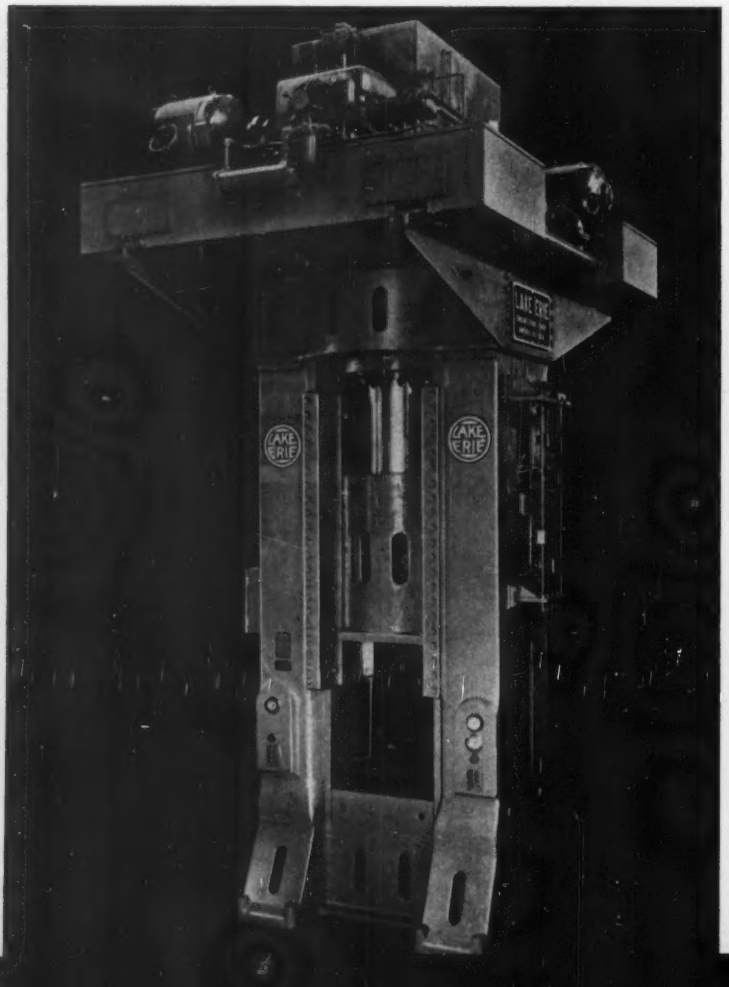
The shaper ram is reciprocated hydraulically and has adequate capacity for taking heavy cuts at maximum feeds. An arbor within the ram provides rotary feeds to the slotter bar which is made in sizes from 3 to 4 1/2 inches in diameter, depending upon the rough opening size. The controls have been brought forward so that the operator has a clear view of his work.



Special hydraulic single-purpose draw-cut shaper built by Morton Mfg. Co.

A special cradle type fixture is provided which has both horizontal and vertical feeds and power traverse. The breech-ring is centered in a spool type chucking ring which, when placed in the fixture, can be rotated through 180 degrees. The fixture is also provided with an eccentric-operated mechanism which tilts it to the correct angle for establishing the proper taper for the nonparallel surfaces.

The rotative feeds for the slotter bar, vertical and horizontal feeds of the fixture, and the ability to index the fixture through 180 degrees combine to make possible complete and rapid rough-machining of the inside of the rectangular opening without removal of the work from the fixture. Additional chucking rings can be provided so that the work can be loaded and centered in an extra ring, thereby keeping the machine in constant production.

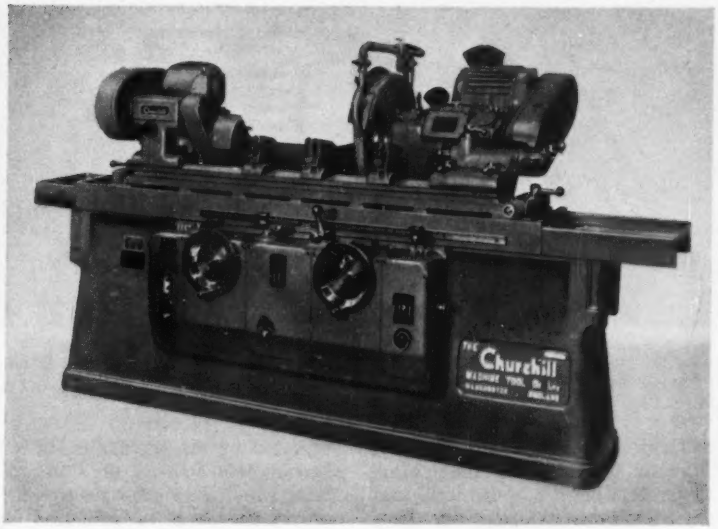


Presses for Cold Extruding Artillery Shells

The Lake Erie Engineering Corporation, Box 68, Kenmore Station, Buffalo 17, N.Y., is building a complete line of large hydraulic presses for the Central Foundry, Holt, Ala. The presses in this line, the smallest of which is shown in the illustration, are all being installed under the sponsorship of Army Ordnance for use in the manufacture of steel artillery shells by the cold extrusion process. This process is said to provide remarkable savings in material consumption and machining time, and to result in greater accuracy and finer tolerances in the finished projectiles.

The press seen exerts 1000 tons working force. The bed is machined to take a 75-ton hydraulic ejector and for the insertion of a hardened steel thrust plate to absorb the concentrated load during extrusion operations. Four extra long adjustable gibs provide positive alignment.

Smallest of a line of Lake Erie presses being built for manufacture of steel artillery shells



Cylindrical grinding machine which is being introduced in this country by British Industries Corporation

Hydraulic Cylindrical Grinding Machine

British Industries Corporation, 164 Duane St., New York 13, N.Y., is introducing in the United States a Churchill Model BW 10- by 36-inch hydraulic plain grinding machine. This 10-inch swing machine is an advanced design of a small plain grinding machine, developed to operate with equal efficiency on either traverse or plunge grinding work. It is equipped with patented self-adjusting "Hydrauto" grinding wheel spindle bearings, a Nitralloy spindle, and pump lubricated bearings.

The table is hydraulically operated and is said to reverse smoothly at all speeds. For plunge-cut grinding, the table can be reversed on strokes as short as 1/8 inch. The work-head is driven by a variable-speed motor, providing a wide range of speeds. Direct current for operating the variable-speed motor is furnished by a generator incorporated in the machine. The motor is dynamically balanced to assure smooth running under all conditions.

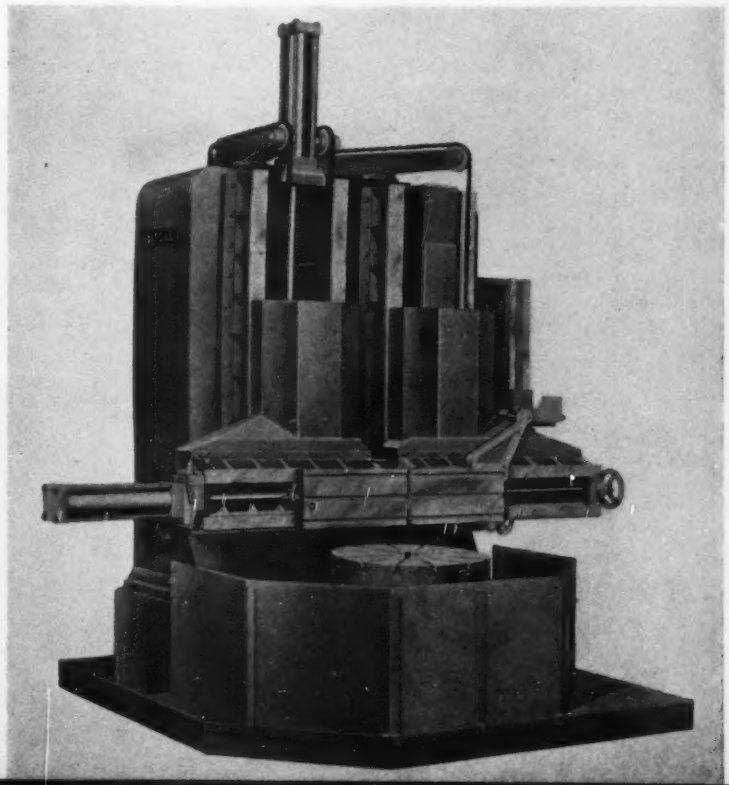
All electrical controls are waterproof and oilproof, and all motors are mounted outside the body of the machine. Can be had with a fully hydraulic auto-sizing wheelhead arranged for diminishing feed to size, or with the Churchill "Fulcro-Sizer" fine feed. The sizing cycle includes rapid approach of wheel to grinding position, work rotation, diminishing of feed during grinding, adjustable dwell period to provide accurate sizing, signal light during dwell, quick withdrawal of wheel to rest position, and stopping of machine for removal of finished work.

Ex-Cell-O Precision Contouring Machine

The new type of production machine shown in the illustration has been brought out by the Ex-Cell-O Corporation, 1200 Oakman Blvd., Detroit 32, Mich., to meet the demand for equipment capable of fast, accurate machining of large round parts such as jet-engine compressor wheels. This Style 426-A vertical precision contouring machine performs such operations as boring, turning, facing, grooving, and rabbeting.

A tracer carried on the horizontal member of the right-hand compound slide controls both vertical and horizontal movements when performing contouring operations. The tracer finger follows the form on a hardened and ground flat steel template. Both vertical and horizontal members of the contouring slide are operated through ground lead-screws driven by individual variable-speed motors. The feed per revolution is kept constant throughout the cut, regardless of variations in the contour or table speed, through electronic control.

The left-hand compound slide consists of a vertical slide supporting a horizontal tool-slide, both of which are operated by large hydraulic cylinders. The vertical slide provides feeds for



Vertical precision contou ing machine designed for production work by the Ex-Cell-O Corporation

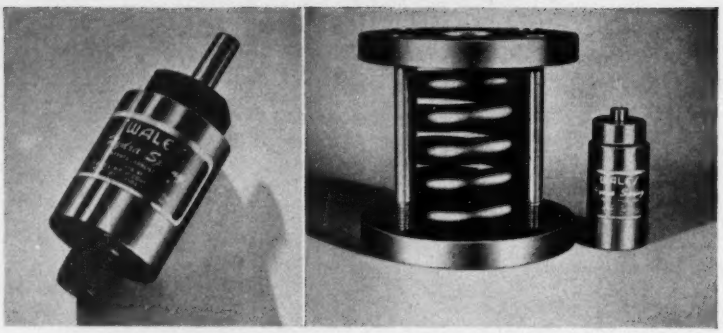
turning, boring, and rabbeting, while such operations as facing and grooving are done during the feed stroke of the horizontal slide. Seven different automatic cycles are possible with the left-hand compound slide.

The normal machine cycle includes operation of both compound slides in sequence, and can be arranged to permit either slide to operate first. All slide ways are hardened and ground steel, and are lubricated automatically to insure continued accuracy. A large table supported on a vertical work-spindle simplifies loading and unloading. The spindle is mounted in tapered roller bearings and is worm driven.

Wales "Hydra-Spring" for Die Strippers

The Wales-Strippit Corporation, 345 Payne Ave., North Tonawanda, N. Y., has announced the development of a pressure exerting unit called "Hydra-Spring" for operating strippers in punching and notching equipment. The unit is designed to provide up to 600 per cent greater stripping pressure than ordinary coil springs of similar size. This outstanding performance is obtained by utilizing the compressibility of a special fluid called "Comproil."

It is claimed that "Hydra-Springs," in addition to simplifying die design and diemaking, make feasible die operations that were previously impossible. They permit stripping pressures to be adjusted by simply adding or reducing the volume of Comproil fluid, which also provides a resilient action such as produced by conventional springs.



(Left) "Hydra-Spring" brought out by Wales-Strippit Corporation. (Right) Small "Hydra-Spring" contrasted with a heavy railroad car spring of same capacity

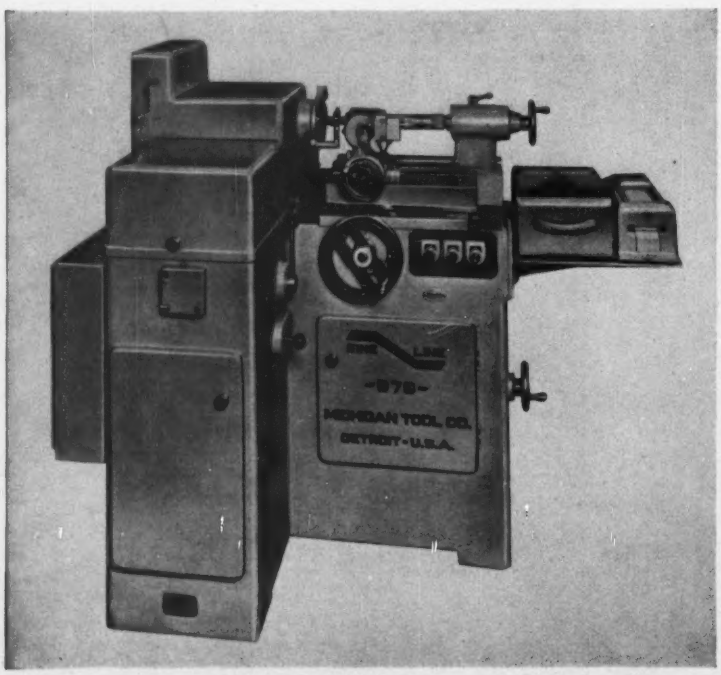
"Sine-Line" Lead Checker for Inspecting Hob and Worm Leads

A "Sine-Line" lead checking machine designed for use in inspecting hobs and worms has been announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. In addition to inspecting leads on hobs and worms, this Model 876 machine will check hob flute spacing and thread spacing on multiple-thread hobs. An auxiliary fixture can be mounted on the machine in place of the indicator head to permit checking of hob pressure angles.

The lead checker can be hand-operated or motor-driven. Automatic recording equipment can be provided for use in conjunction with the checking machine. In checking leads, the rotation of the hob or worm spindle and translation of the indicator table parallel to the hob spindle is effected by a sine-bar table on the machine base.

A precision-ground master rack mounted on the sine-bar table engages a pinion that drives the hob spindle through hardened and ground master change-gears. The indicator table, which is mounted on hardened and ground ball ways, is held against the sine bar with constant pressure. The machine is set up to check a given lead by selecting change-gears according to tabulations included with a formula sheet, and by calculating the correct sine-bar setting. Deviations from the true lead are shown in ten-thousandths inch.

Index-plates are used to check hob flute and thread spacing. Two table drive speeds are provided. An indicator table rapid return mechanism speeds checking operations. This lead checker has a



Lead ch king machine for inspecting hobs and worms has been introduced by Michigan Tool Co.

capacity for checking hobs ranging from 1/4 inch to 8 inches in diameter. The maximum capacity between centers is 13 inches. The machine will check right- or left-hand leads from 0 to 7.2 inches. It is powered with a 3/4-H.P. 1800-R.P.M. motor. The machine is 53 1/2 inches high, 64 inches wide, and 45 1/2 inches deep.

Lithium Hot-Atmosphere System

The Lithium Co., 111 Sylvan Ave., Newark 4, N. J., has developed a hot-atmosphere system for application to any indirect-fired furnace now being used without protective atmosphere. Conversion to this system is said to result in increased furnace output and a considerable reduction in the costs for pickling and cleaning after annealing or normalizing.

A recent installation of this system in the conversion of a continuous roller hearth furnace for annealing welded stainless-steel tubing is shown diagrammatically in the illustration. The primary reason for converting this furnace to lithium hot-atmosphere operation was to provide a high degree of protection against scaling or oxide formation on the surfaces of the stainless-steel tubes during annealing or normalizing.

Previously, a costly operation of pickling and cleaning after each anneal was required. The installation of lithium vaporizers in conjunction with standard exothermic gas cracking chambers, attached to the furnace, provided the means for protecting the surface of the work and for adding heat to the furnace.

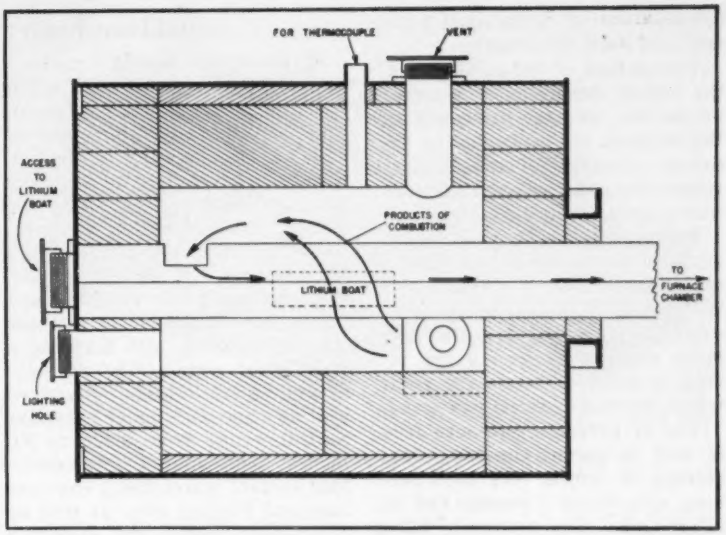


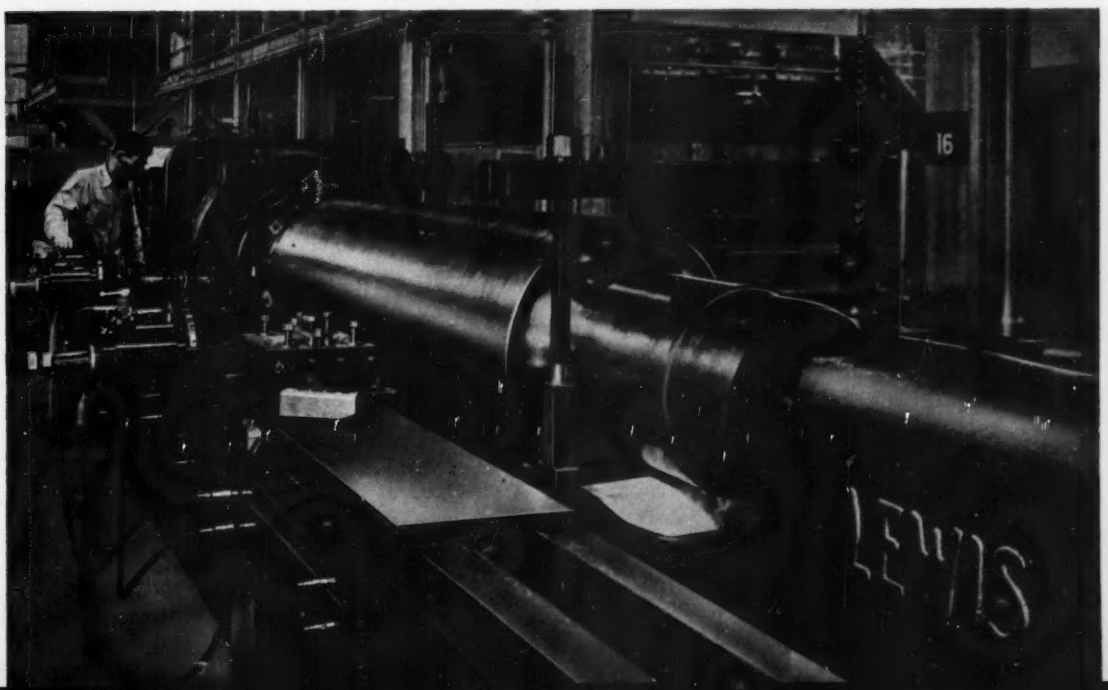
Diagram illustrating application of lithium hot-atmosphere furnace for annealing welded stainless-steel tubing

Lewis Hydraulic Roll Lathe

A 60-inch hydraulic roll lathe, which is said to be the largest size commercially produced, has been built by the Lewis Foundry & Machine Division of the Blaw-Knox Co., at Groveton, Pa., for installation at the new Fairless Works of the U. S. Steel Co.

Hydraulic lathes of this design are said to have made savings in production time of up to 75 per cent. The chief saving in time is realized by converting the roll machining operation from a manually fed intermittent cutting operation to a continuous turning

Huge hydraulic roll-turning lathe built by Blaw-Knox Co.'s Lewis Foundry & Machine Division



cut obtained by hydraulical traverse and feed movements.

The in-feed of the cutting tool, the lateral movement or traverse of the tool, and the movement of the tailstock are controlled by hydraulic pressure. These features relieve the lathe operator of much heavy manual work.

Provision has been made for increasing the width of cut from a maximum of about 5 inches for the manually fed roll lathes to as much as 8 inches for the new lathe and for increasing the in-feed or depth of cut to any point which the tool material will stand.

Use of hydraulic pressure feed is said to permit the rough-machining of certain very hard surface rolls which formerly had to be ground. The hydraulic lathe also makes it feasible to operate several cutting tools simultaneously, as, for example, one on each side of the roll or two tools working at opposite ends on the same side of the roll. Traverse movement of the carriage is available from left to right and from right to left.

The particular machine illustrated is equipped with a 60-H.P. main drive motor with variable speed from 300 to 1200 R.P.M. and a separate motor for the hydraulic pumps.

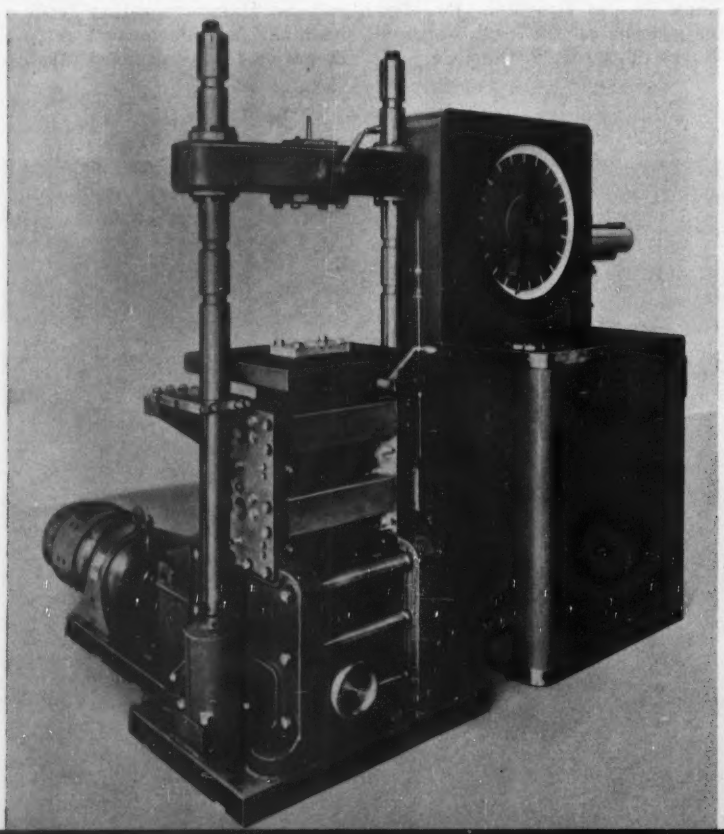
Baldwin-Emery Testing Machine

A universal testing machine designated the Model FGT Baldwin-Emery SR-4, which incorporates an electric weighing system and an electronically controlled, motor-driven loading mechanism, has just been announced by the Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa. With a load capacity of 50,000 pounds, this equipment has weighing and measuring tolerances of 0.2 per cent of reading, and features a high speed response to dynamic as well as static loads. Standard loading speeds, under stepless control, range from 0.025 to 9.0 inches per minute. Automatic load control maintains a constant load and loading rate, as well as a constant strain and straining rate, thereby enabling determination of creep, rupture, and relaxation properties of materials.

Loads are measured by means of two universal load cells, each having a capacity of 30,000 pounds. Three load ranges are provided on a separate indicator with a 24-inch diameter dial having 1000 graduations in 66 inches, reading from 0 to 50,000 pounds, 0 to 10,000 pounds, and 0 to 2000 pounds. Lower ranges are available by fitting a detachable universal load cell on the cross-head and connecting it into the load indicating dial.

The load system, having a maximum stroke of 8 inches, utilizes a single enclosed reversing screw rotated by a 2-H.P. motor with a speed range ratio of 360 to 1. The test table is 20 inches square, and the maximum vertical space is 24 inches for both tension and compression tests. Clearance between columns is 21 inches.

Associated stress-strain recording equipment can take signals both from load cells and from an extensometer. For normal rates of recording, an SR-4 converter is interposed so that a standard Baldwin Microformer can be used. Any X-Y recording potentiometer can also be used. For high straining rates or for alternating loads, oscillographs or oscilloscopes can record load versus strain, the latter on a persistent type screen. Signals are fed through preamplifiers.



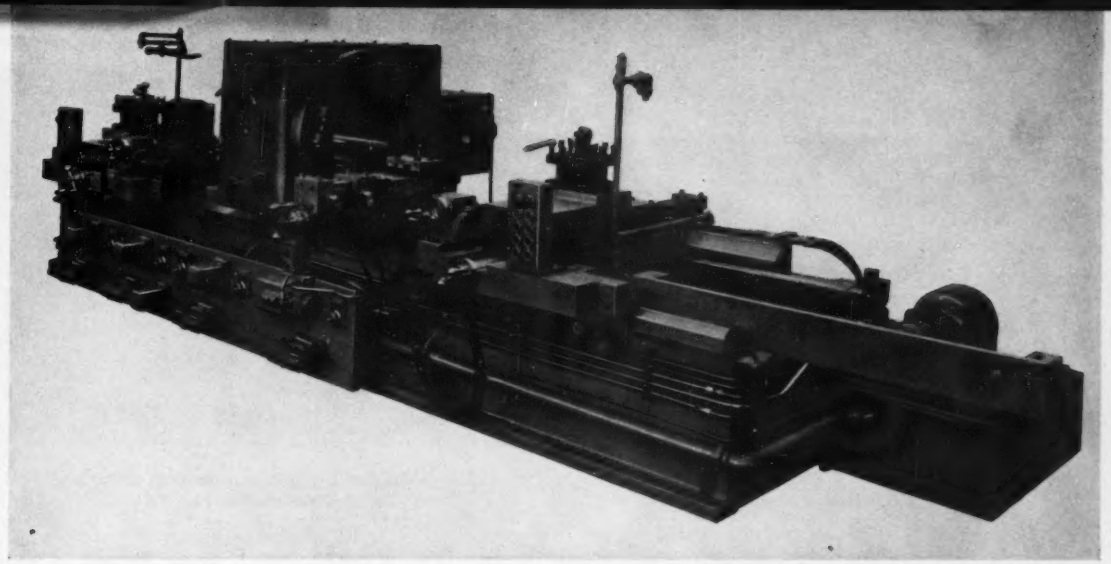
Baldwin-Emery testing machine with electric weighing system

"Hydratrol" Lathe for Machining Jet-Engine Frames

A special 42-inch swing hollow-spindle "Hydratrol" lathe has been developed by the Lehmann Machine Co., Chouteau at Grand, St. Louis 3, Mo., for machining turbine frame assemblies for jet engines. This large lathe is designed to perform all the turning, boring, and facing operations on jet-engine assemblies at one setting, maintaining dimensional accuracy, and relative concentricities and squareness of the machined surfaces.

The hole through the spindle and the chucks of this machine is 18 inches in diameter, and the face-to-face distance between the chucks is 30 1/2 inches. Special chucks and segmented "bracelets" that surround the gripping surfaces are used to prevent distortion of the work. Hydraulic longitudinal feeds with automatic stops are provided to meet all dimensional requirements.

In all, sixteen surfaces are machined on the turbine frame assemblies, requiring eight facing, five turning, and three boring op-



Lehmann hollow-spindle "Hydratrol" lathe developed to machine turbine frame assemblies for jet engines

erations. Hand valve control provides rapid traverse to all slides. Chips are held in the top section of a pan at the rear of the machine, and the coolant flows to the lower section of the pan. The bed of the machine is 16 feet long, 42 inches wide, and has hardened steel ways. There are six spindle speeds ranging from 21 to 100 R.P.M. A 20-H.P. motor drives the hydraulic friction clutches on the pulley shaft. The complete machine weighs 30,000 pounds.

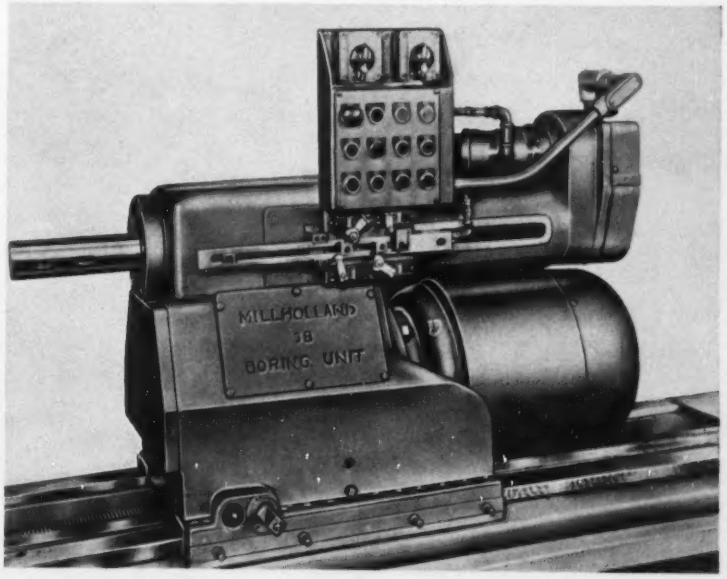
Millholland Automatic Boring Unit

A No. 3B boring unit which is basically a fixed-center horizontal boring mill designed for automatic cycle operation has been announced by the W. K. Millholland Machinery Co., Inc., 6402 Westfield Blvd., Indianapolis 20, Ind. The boring unit body is a heavily constructed box-ribbed semi-steel casting. A hardened high-alloy steel spindle reciprocates through hardened steel bushings mounted in the sleeve. The sleeve is contained at the forward end in two Timken precision bearings, and the rear-mounted third bearing is permitted to float. The spindle reduction drive is full ball-bearing mounted and has gears designed to give a large factor of safety. Final drive is through helical gears.

The feed mechanism is operated by means of a hydraulic pump and a fluid motor. The fluid motor drives through a gear reduction to the lead-screw which, in turn, feeds the lead-nut mounted in ball bearings on the end of the spindle. A system of valves and piping permits cycle adjustments to be made within the range specified. The pump has a two-pressure system incorporating an automatic unloading valve, and is mounted on a tank apart from the machine. The multiple-piston rotary type fluid pump is of the constant displacement type.

Lubrication of the spindle reduction gear drive and bearings is maintained from a pressure system operating in a reservoir in the main casting. Other points are lubricated through Alemite fittings. Changes of feed during the automatic cycle are controlled by means of adjustable dogs arranged to contact limit switches. However, the positive stop switch need only be roughly adjusted because this contact actuates a solenoid which permits a rotary stop mounted on the lead-screw to function. The rotary positive stop, however, is adjustable in approximately 0.001 inch increments. Longitudinal adjustment of the complete unit by hand can be provided.

The unit is driven by a 5- to 10-H.P. motor. Spindle speeds of from 33 to 500 R.P.M. are obtained by means of pick-off gears. The spindle is 3 inches in diameter and has a No. 5 Morse taper. The boring-bar stroke is 10 inches.



Automatic boring mill unit announced by W. K. Millholland Machinery Co.

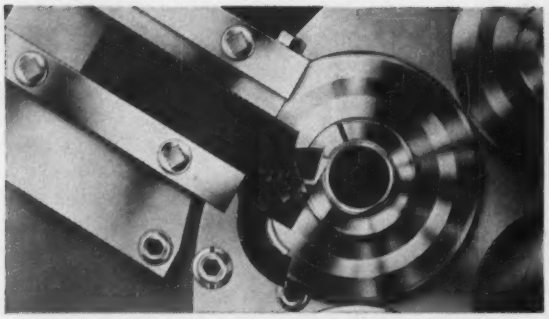


Fig. 1. Cut-off tool brought out by Cir-Cut Division, New Britain Machine Co.

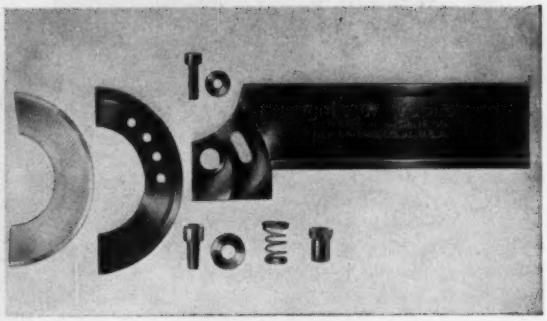


Fig. 2. View showing individual parts of cutter and holder illustrated in Fig. 1

Circular Type Cut-Off Tool

A circular cut-off tool based on a new concept of tool design is now being offered to the metalworking trade by the Cir-Cut Division of the New Britain Machine Co., New Britain, Conn. The tool is fundamentally a semicircular disc of the finest grade high-speed steel, with the cutting surface on the periphery.

The blade is mounted in a holder as shown in Fig. 1, with all but the cutting edge protected by an envelope or shroud. The toolholder is accurately located in the machine so that the cutting edge is on the spindle center line. The holder can be substituted for the conventional straight blade-holder in most screw machines up to 1 5/8-inch capacity.

The top of tool is hollow-ground to collapse the chip and lessen heat generation from chip flow on the edges of the tool. Side clearances are ground in the blade during manufacture and remain constant throughout the life of the blade. The front clearance angle is ground in the blade prior to shipment. To facilitate grinding, guide lines are stamped on the sides of the blades. The top rake is constant, being formed in the tool as it is resharpened. Control of chips during the cut is maintained by grinding the shroud, not the tool edge.

Tool-holder adapters have been designed to replace adapters previously in use, and not only assure proper alignment with the spindle but permit a total of 0.090-inch height adjustment to correct for spindle variations.

Reed-Prentice Vertical Milling Machine

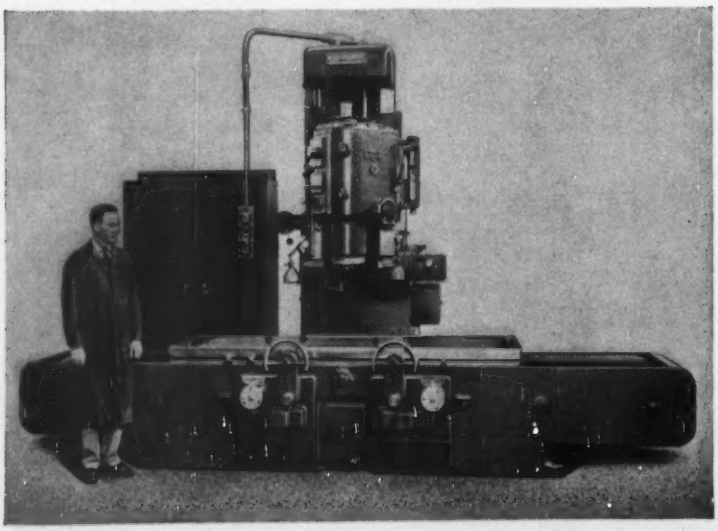
The heavy-duty No. 4 electronic vertical miller manufactured by the Reed-Prentice Corporation, 677 Cambridge St., Worcester 4, Mass., is now being equipped with a new pendent control. This equipment provides instant push-button control of the spindle movement and the electronic feed power. In addition to affording greater ease of operation, the pendent station is particularly useful for spindle jogging.

The No. 4 miller has an electronic feed drive for the table, cross-slide, and vertical slide. Feed rates are infinitely variable, and the range of feeds is from 1/2 inch to 25 inches per minute. Centralized operating levers are within easy reach of the operator. The table and cross-slides have identical control systems, each consisting of an airplane type half-handwheel and ball-grip lever. The half-handwheel gives an infinitely variable feed rate in either direction, and the five-position ball-grip levers provide feed and rapid traverse in either direction.

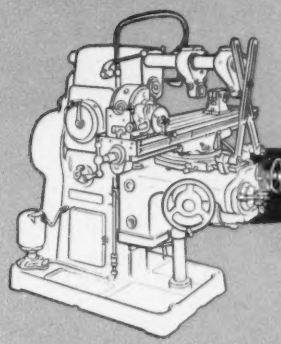
The spindle is reversible and is driven by a 20-H.P. 1800-R.P.M. motor. For milling non-ferrous metals, a 30-H.P. spindle drive motor can be used.

This heavy-duty miller is built in two sizes—the 60-inch model, providing a working surface of 24 by 96 inches and the 96-inch model with working surface of 24 by 132 inches. One-, two-, and three-dimension General Electric contour follower systems are available for both models.

(This section continued on page 233)



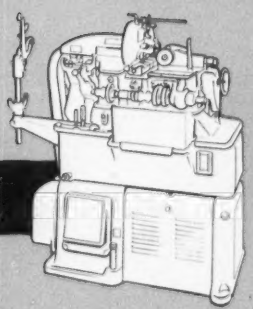
Electronic vertical miller with pendent control manufactured by the Reed-Prentice Corporation



MILLING MACHINES

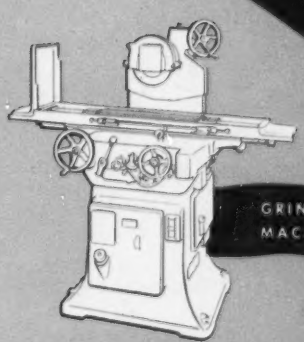
B·S Produ

to meet unusual demands today and in the BIG *years ahead*



SCREW MACHINES

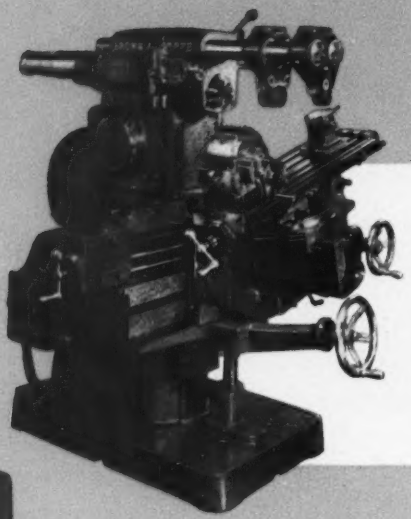
Today, tomorrow, and in the years ahead, your metalworking machines must carry a greater load than ever before . . . and they may be required to accommodate both civilian and defense production demands. That's why it will pay you to investigate the superior qualities of adaptable Brown & Sharpe Milling, Grinding, and Screw Machines. Each of these machines is soundly engineered to do a broad class of work more efficiently — "Productioneered" to give you maximum productivity, precision, and profit on every job.



GRINDING MACHINES

pe

B·S *Productioneered for High Precision, Low-Cost Milling on every job*



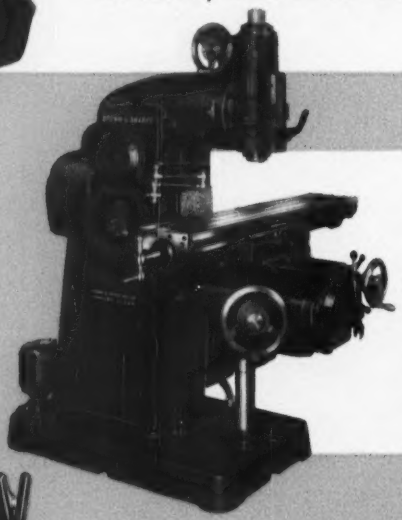
OMNIVERSAL MILLING MACHINE

This machine is the toolmaker's dream-come-true. It's the "last word" in milling versatility for toolrooms and experimental departments. Permits milling, drilling, boring, or reaming at many angles — and in a number of planes — without relocating work in holding devices . . . saves hours of expensive set-up time.



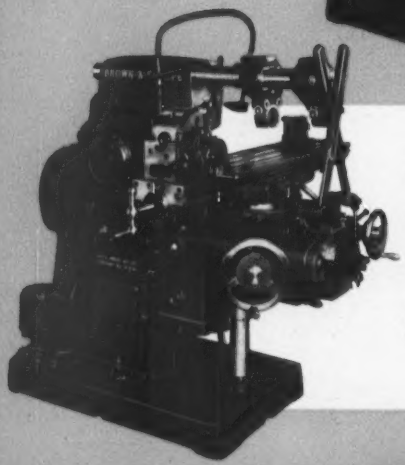
MANUFACTURING TYPE MILLING MACHINES

The No. 000 Plain Machine provides economical production milling of small parts, and the No. 12 Plain Machines (illustrated) with 3 or 7½ H.P. spindle drive are outstanding for the majority of medium-sized work. The electrically-controlled No. 12 machines give you extremely fast, accurate facilities for small or large quantity production. Broad choice of speeds and feeds, and automatically controlled fast travel plus dual feed rates save operating time.



VERTICAL MILLING MACHINES

No. 2 Verticals, available with 3 or 5 H.P. (3 H.P. illustrated), are designed for rapid, easy set-up and operation on production and toolroom work. All controls are grouped within easy reach of operator, and fast travel movements are provided in all directions. The swiveling spindle head makes it possible to mill and drill at various angles without special fixtures.



UNIVERSAL AND PLAIN MILLING MACHINES

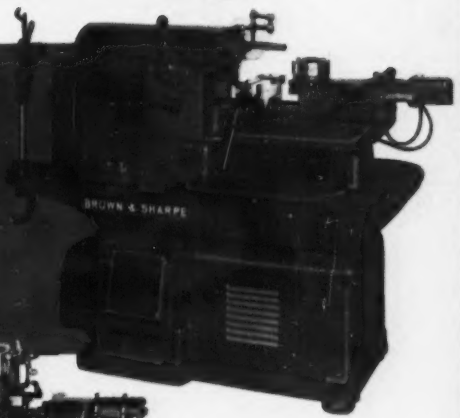
These No. 2 Machines, with full 3 or 5 H.P. drive (No. 2 Universal, 3 H.P. illustrated), incorporate many time-saving features — modern design, tri-motor drive, handy controls and ample speed and feed rates. Extended spindle face provides greater rigidity of cutter support . . . allows using smaller cutters and faster feeds.

B·S *Productioneered* for Repeatedly Accurate, High-Production Screw Machine Work



AUTOMATIC SCREW MACHINES

The Nos. 00G (illustrated), 0G, 2G and the new No. 4 machines permit cutting a wide variety of materials at the most efficient speed for each operation . . . you get higher output, better finish, and more uniformly accurate production. Positive chain drive to spindle and a wide range of two-speed combinations and ratios are provided. Machines also made in Cutting-off types.



HAND SCREW MACHINES

Many short-run bar work and second operation jobs can be more profitably handled on these hand operated machines. Available in three sizes — Nos. 00, 0 (illustrated), and 2 — they perform the same operations as automatics . . . can be set up quickly and inexpensively. Utilize many of the same collets and tools used on Brown & Sharpe automatics.



AUTOMATIC SCREW THREADING MACHINE

This machine efficiently produces small parts such as screws, pins, and bushings. It does forming, slotting, and threading simultaneously, and takes full advantage of overlapping operations . . . cuts idle time to a minimum. Capacity: ⅜" dia.



AUTOMATIC PINION TURNING MACHINE

Extremely high output of staffs and pinions for precision assemblies, clocks, aircraft instruments, timers, etc., is possible on this machine. Furthermore, its simplicity of set-up and operation eliminates the need for expert pinion turning specialists. Tools may be replaced in minimum time and without disturbing tool setting. Capacity: ¼" dia.

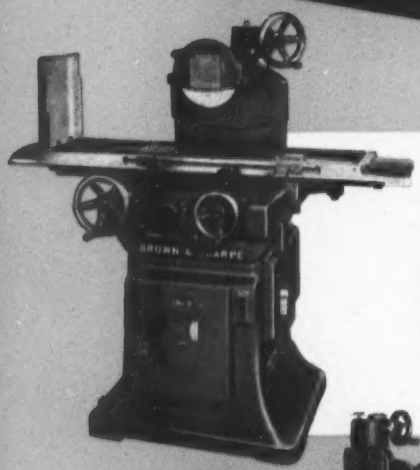
Brown & Sharpe

B·S *Productioneered for Fast and Precise Cylindrical, Surface, and Tool Grinding*



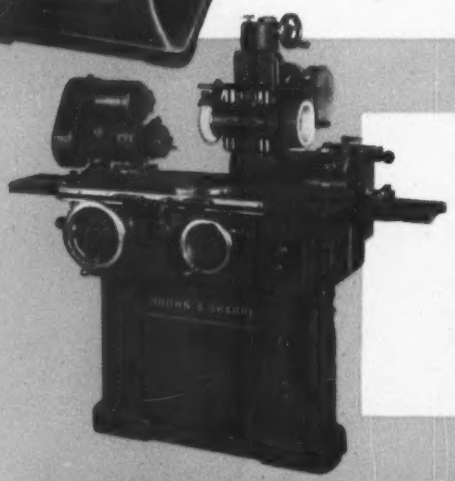
UNIVERSAL AND PLAIN GRINDING MACHINES

One of the most popular machines in this line, the No. 5 Plain (illustrated), makes rapid grinding of small cylindrical work easy and accurate. Once set up, it is operated entirely by two controls — the cross feed handwheel and table start-stop knob. Accurate sizing to tolerances of .0001" on long production runs. Recessed base permits working in a sitting position. Capacity: 3" x 18".



SURFACE GRINDING MACHINES

Nos. 2L, 2LB (hand feed) and No. 5 (hydraulic type) machines are suited for both production and toolroom grinding of accurate flat surfaces. No. 5 (illustrated) particularly is designed for rapid stock removal with fine finish and high precision. Low pressure hydraulic system provides vibrationless application of power, without shock, at all speeds.



CUTTER AND TOOL GRINDING MACHINES

These machines are available in three types: the No. 5 is a small responsive machine particularly suited for end mill sharpening; the No. 10N covers the general field of cutter and tool sharpening; and the No. 13 (illustrated) is designed for grinding small and medium-sized cylindrical work, form grinding, sharpening cutters, reamers, and miscellaneous other work. All three incorporate proven features for profitable operation.

Write for complete information on any of the Brown & Sharpe products listed below

Brown & Sharpe B·S

Milling Machines • Grinding Machines • Screw Machines • Machine Tool Accessories • Cutters
Machinists' Tools • Johansson Gage Blocks • Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R.I., U.S.A.

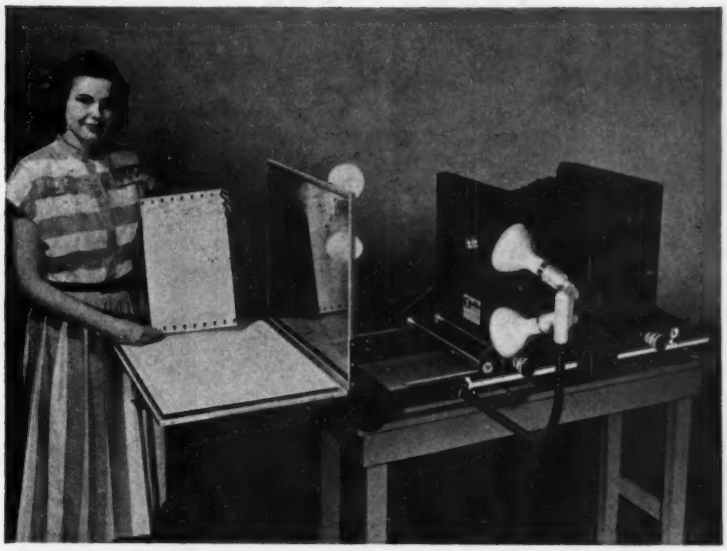


Fig. 1. "XeroX" improved camera for use in making enlarged or reduced copies of drawings or printed matter

Improved Equipment for Reproducing Drawings

An improved camera for making reduced or enlarged copies of an engineering drawing, chart, or other subject has been added to the xerography process equipment made by the Haloid Co., 2-20 Haloid St., Rochester 3, N. Y. In using this improved No. 3 camera, shown in Fig. 1, the copy to be reproduced is placed on the counterbalanced copy board and tilted into the vertical position for exposure to an electrostatically charged "XeroX" plate in the camera. After exposure, the plate is processed in a "XeroX" copier. The image is then transferred to an offset paper master or to a translucent (engineering) paper on which it is made permanent by a fusing operation requiring only a few seconds.

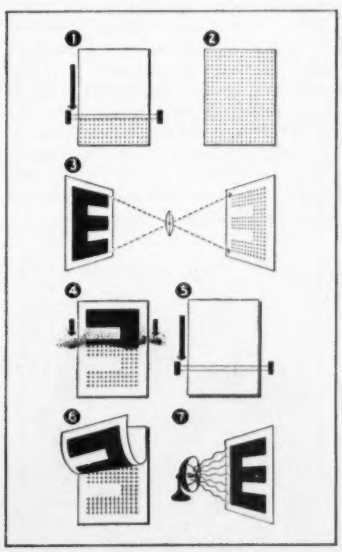


Fig. 2. Diagram illustrating application of xerography process

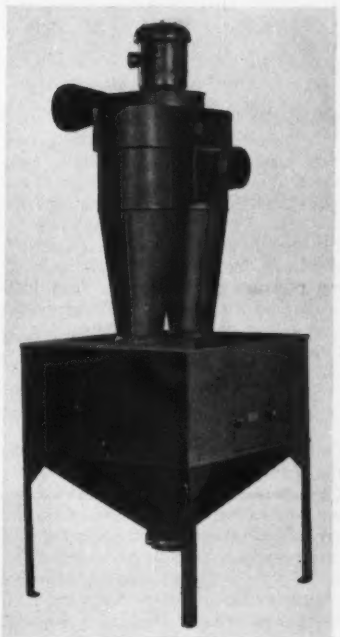
The new camera was developed primarily to provide a method of reducing large engineering drawings or other copy to an 8 1/2- by 13-inch "XeroX" plate from which offset paper masters can be made for running off multiple copies on an offset duplicator. Multiple copies can also be made in a diazo machine using a "XeroX" translucent print as original copy.

The xerography electrostatic reproduction process, as shown diagrammatically in Fig. 2, requires no water, chemicals, films, darkroom, or sensitized film. The various steps required in producing a print by this process are as follows: (1) Surface of specially coated plate is electrically charged as it passes under wires. (2) Coated plate is charged with positive electricity. (3) Copy *E* is projected through lens in camera. Plus marks show projected image with positive charges. Positive charges disappear in areas exposed to light as shown by white space. (4) A negatively charged powder adheres to positively charged image. (5) After powder treatment, as indicated in the preceding step, a sheet of paper is placed over plate which receives positive charge. (6) Positively charged paper attracts powder from plate forming direct positive image. (7) Print is heated for a few seconds to fuse powder and form permanent print.

Torit Dust Collectors

To meet the requirements of heavy-duty continuous grinding and other high dust volume applications, the Torit Mfg. Co., 307 Walnut St., St. Paul 2, Minn., is producing several models of its dust collectors with hopper bottoms and special release valves in cabinet and cyclone types.

When the dust is of a grainy nature, a flexible diaphragm valve is recommended, primarily because of its speed of operation. This new valve is of the "Syntron-Mucon" flow control type. Its nylon diaphragm can be changed from fully closed to wide open by merely moving a lever through 180 degrees of arc.

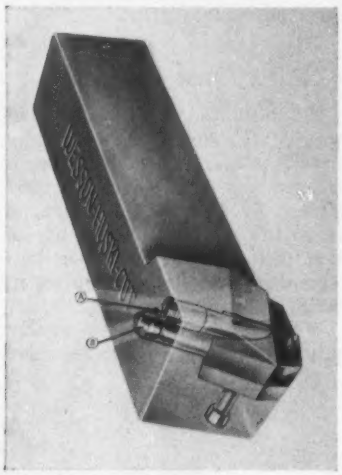


Dust collector equipped with special hopper valve brought out by the Torit Mfg. Co.

When dusts are of sharp materials, such as shavings and chips, a rubber-faced Torit plate valve is recommended.

Wesson "Huski-Cut" Tool-Holder

Tool-holder recently added to the Standard line of the Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Detroit 20, Mich. The new holder,

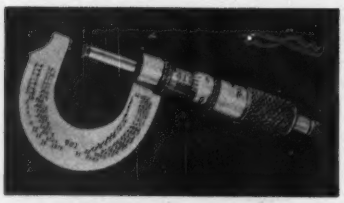


named the "Huski-Cut," can be used with extremely heavy feeds and very high speeds. The mechanically held insert requires no brazing, and the shank need never be ground. The insert can be adjusted by screw (B) without removing the holder from the machine. Screw (A) controls the holding pressure on the insert. The toolholder is offset to provide generous chip clearance, and it is available in three styles and forty sizes.

Carbide Indicator Points

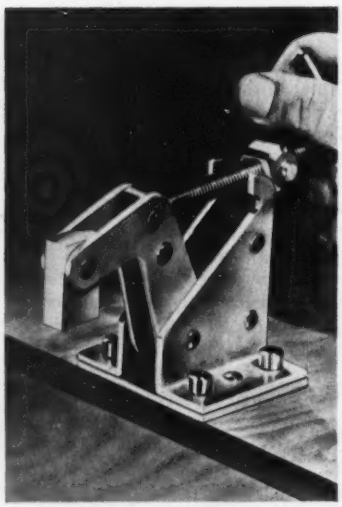
Carbide indicator points introduced by the Eastern Tool Co., East Hartford, Conn. These "Etco" indicator points are said to have exceptionally long life and to withstand sudden gaging shocks and friction of rapidly revolving cylindrical pieces. Each set comes with five standard shaped points—flat face, ballpoint, needle point, conical point, and convex face.





Micrometer with "Lustro-Chrome" Finish

Micrometer with "Lustro-Chrome" finish developed by the George Scherr Co., 200 Lafayette St., New York 12, N. Y. This chromium surface is said to be extremely hard and non-peeling. All graduations appear very sharp and clear against the dull chromium background, making reading easier and surer, even in poor light. The new finish serves to protect the micrometer indefinitely from rust and discoloration. Another feature now available in this micrometer is the tungsten carbide-tipped anvils.

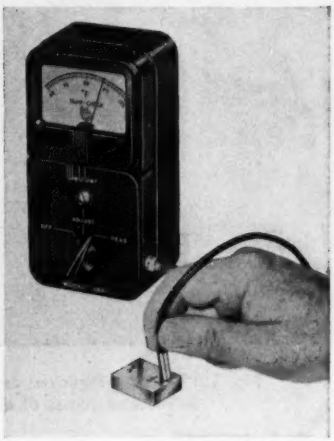


Cisco Quick-Acting Fixture

Quick-acting fixture clamp, incorporating the "Saxton" principle of clamping, introduced by Centinela Industrial Supply Co., 11930 Inglewood Ave., Hawthorne, Calif. This unit is suited for use on practically all kinds of milling, drilling, riveting, and assembly fixtures. A twist of the wrist removes the trunnion from the retaining hook in the mounting bracket, and the full open position gives unobstructed vertical clearance for removal of finished work. The powerful gripping capacity of the clamp, combined with its non-flexing design, is said to eliminate chatter during milling or intermittent cutting operations. Sizes available include 3- and 6-inch throat depths.

"Temp-Check" for Work and Gage Temperatures

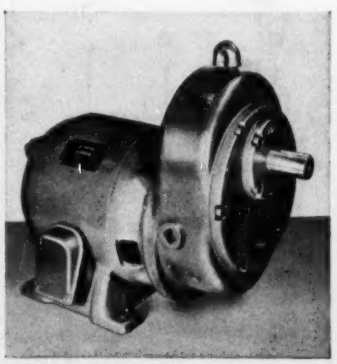
"Temp-Check" brought out by the Webber Gage Co., 12909 Triskett Road, Cleveland, Ohio, for accurately measuring temperatures of either gage-



blocks or work, or both gage-blocks and work, in order to eliminate errors in making precision measurements due to differences in the temperatures of gages and work. The standard model "Temp-Check" is calibrated from 60 to 100 degrees F.

Westinghouse Single-Reduction Gearmotor

"Lifeline" single-reduction gearmotor brought out by the Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa., to meet the mounting limitation requirements peculiar to side entry agitators and mixers. These gearmotors are also suitable for light-duty coupled service applications to fans, pumps, and similar equipment. Available in ratings from 1 to 30 H.P. 780 to 420 R.P.M., AGMA Classes I and II. The reduction gears give these gearmotors the advantage of using the smaller and more efficient high-speed motors for slow-speed drives.



Outstanding ACCURACY is necessary...

TO PRODUCE THESE *top quality products*



Slots, angles and compound angles are shaped to 0.001" limits on these solid 3140 forged steel tool holders.



Special index heads have slots accurate in shape, size, spacing and angularity to 0.001" on all dimensions.



Vee block fixtures of solid 8145 steel are completely shaped to very close limits.

Cincinnati Shapers do these jobs

The Jordan Specialty Company . . . Shaping Specialists . . . use Cincinnati Shapers exclusively. Outstanding accuracy and versatility in production are obtained in connection with low machine investment and low tooling costs. Due to the great variety of work produced, changes from part to part must be done with minimum loss of time. Here, Cincinnati Shapers give an exceedingly profitable and outstandingly accurate performance.

Write for Shaper Catalog No. N-5 covering the complete Cincinnati line.

Photo courtesy Jordan Specialty Company, Detroit, Michigan

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Outstanding ACCURACY

TO PRODUCE



Modern Steel Kitchen



Hospital Sterilizer



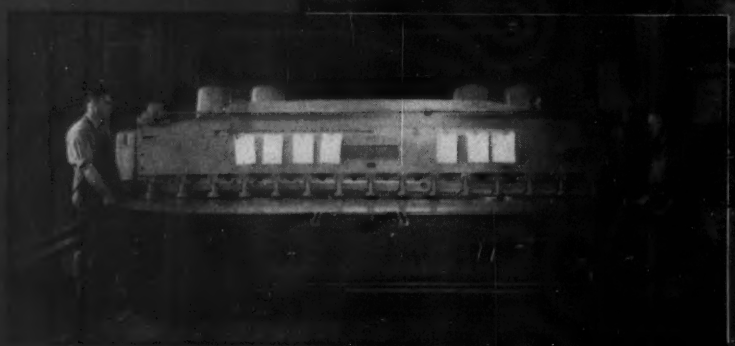
Hospital Utility Cabinet



Special Stove

Three Cincinnati All-Steel Shears at Jamestown Metal Products Inc.





1814 Cincinnati All-Steel Shear with hydraulic holddowns, squaring arm and front controlled power back gauge.

is necessary...

THESE TOP QUALITY PRODUCTS

ACCURATE SHEARING

Jamestown Metal Products Inc. produces quality stainless steel equipment for hospital and home. Exact manufacturing standards are maintained.

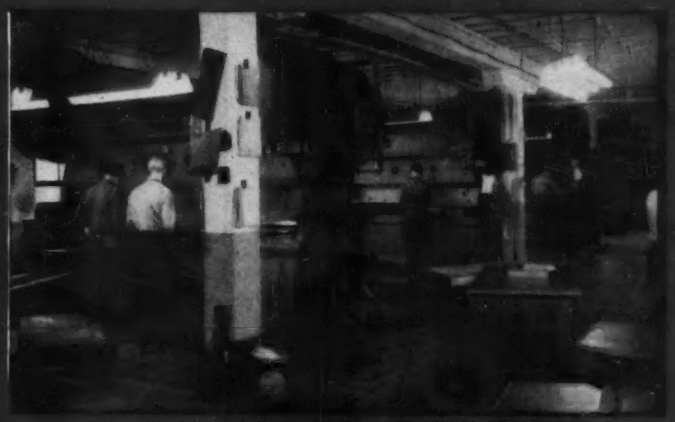
Cincinnati Shears cut blanks accurately and to size for this equipment. Gauging must be rapid as well as accurate to handle the many different sizes required and keep production costs low.

ACCURATE FORMING

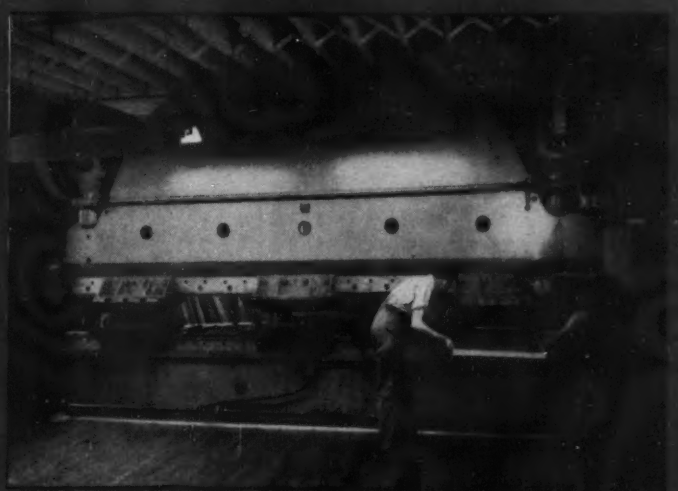
Cincinnati Press Brakes form these blanks into accurate parts that fit correctly and insure outstanding quality in the finished products as well as maintaining low assembly costs.

You, too, can expect true blanks and accurately formed parts from this profitable team of Cincinnati Shears and Cincinnati Press Brakes.

Write for Catalogs S-6 and B-3, illustrating and describing these machines.



A row of Cincinnati All-Steel Press Brakes used in the production of these quality products

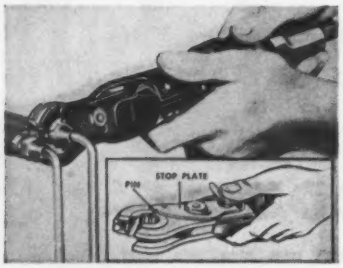


A 130 x 14' Cincinnati All-Steel Press Brake 14' 6" between housings tooled for multiple operations

THE CINCINNATI SHAPER CO.

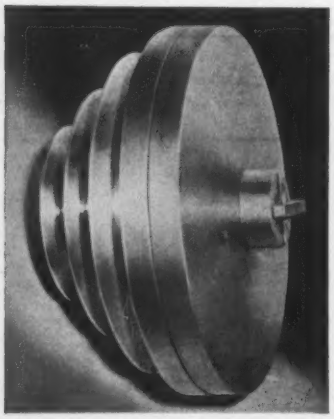
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI



Open-End Ratchet Wrench

Open-end air-operated wrench designed for reaching into inaccessible places and applying power to turn down nuts. This versatile tool enables workmen to use air power for what would otherwise be time-consuming operations with hand tools. It is especially adapted for use in the installation of refrigeration tubing or hydraulic piping. It may be used either to tighten or remove unions, junctions, and couplings. Available in two sizes capable of handling hexagonal nuts ranging from 3/8 to 3/4 inch across flats. Product of Keller Tool Co., Grand Haven, Mich.

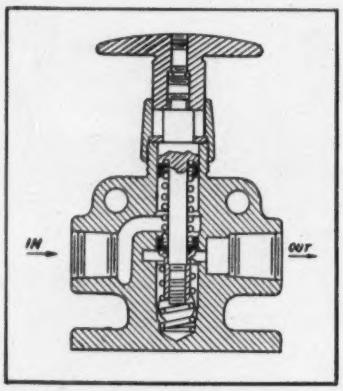


Pull-Gear Speed Reducer

Speed reducer, known as the Model PG-7b "Pull-Gear," designed to give a 7 to 1 reduction directly off the motor, with spindle speeds of 45 to 2000 R.P.M. This speed reducer is specifically designed for use with machinery employing the "B" type belts, and is available in 3/4-inch shaft bore size. With "Pull-Gear" units installed, the equipment has a much greater range of speeds. The use of this type of gear reduction is said to tremendously increase the pulling power, adapting it for larger drilling, tapping, and boring operations. This unit is self-contained and is made from an aluminum casting. Ball bearings are used throughout the unit to assure long and trouble-free life. Product of the Pull-Gear Co., 21125 Dequindre, Hazel Park, Mich.

Rivett Pilot Air Valve

Pilot air valve of a new Series 3000 line just announced by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. These valves are designed for remote control of pilot pressure operated four-way air valves, and for remote control of Rivett air pilot hydraulic valves. They can also be substituted for direct control valves in such installations where a 1/4-inch three-way valve is required. Operating

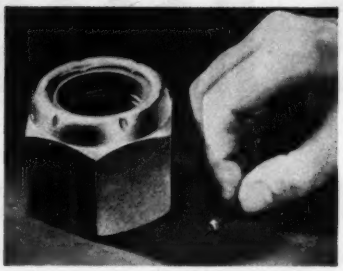


the valve allows air to flow to the "out" port. A spring returns the valve to its original position, blocking the air supply, and bleeding the "out" port. Palm button, push-button, and cam-operated types are offered in both side and foot mounting designs.

"Derry" Angle Computer

"Derry" angle computer designed to measure in degrees and seconds any angle—simple or compound—within a hemispherical area on two precision graduated protractors. By simply pulling a vernier release pin, the angle computer can be set to any desired angle quickly and easily. To obtain a precision setting, the pin is re-inserted and used as a key for accurate adjustment. This computer is available from Scientific Engineering, 11126 Weddington, North Hollywood, Calif.





Miniature Elastic Stop-Nuts

Tiny hexagonal nut, with nylon insert, shown here suspended on needle point for comparison with giant nut at left which measures 2 3/8 inches high, 2 3/4 inches across flats, and is used on big Diesel engines, locomotives, and oil drilling equipment. Both nuts are products of the Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J. The miniature nut is available in brass or aluminum. The smallest size measures only 0.109 inch across flats. These miniature nuts are designed for use in electronic controls, cameras, hearing aids, and instruments of various kinds.

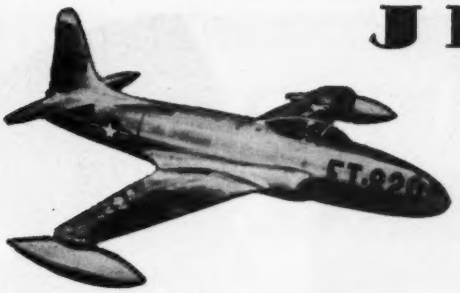
Sound Analyzer

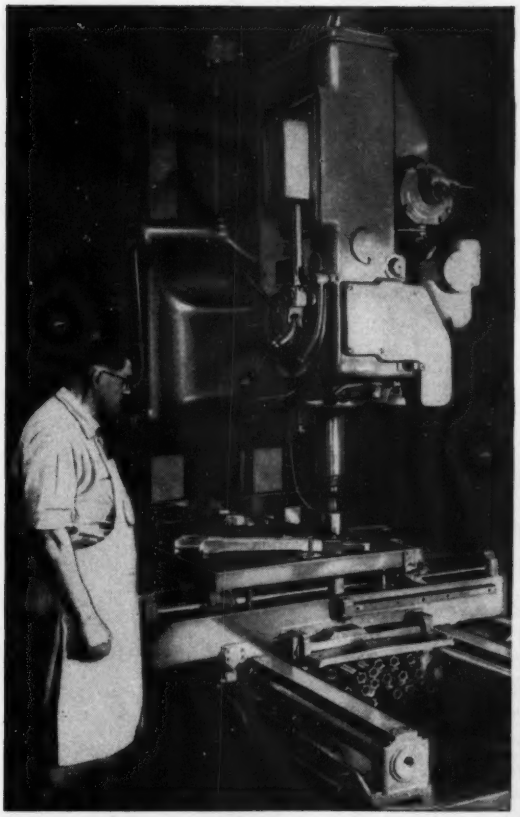
Versatile sound analyzer developed by Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass., to



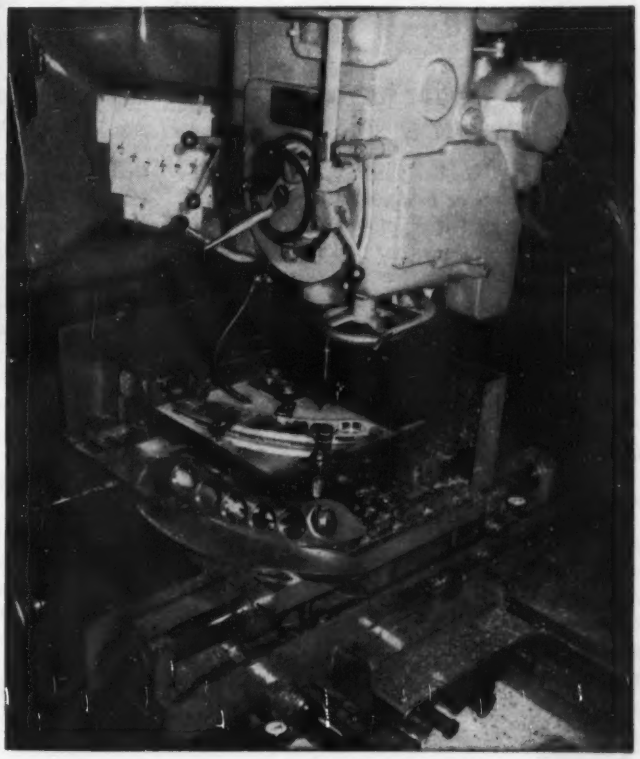
separate noise, sound, and vibration signals into their component frequency bands. Such an analysis is fully as important as measurement of noise intensity in dealing with machinery and blower noise, industrial hygiene, and acoustical contracting problems. The high- and low-pass filters can be independently adjusted in steps of 1/2 octave. A simple interlock permits the pass-band width to be fixed in any multiple of 1/2 octave. The position of this pass-band can then be adjusted throughout the audible range by a single control.

JIGLESS ACCURATE DRILLING





Precision production work without the use of jigs, at Lockheed, is now being accomplished on the Cincinnati Bickford PRECISION Drilling Machine, equipped with a Bullard Man-Au-Trol Spacer. A variety of production jobs, such as cutting holes approximately 3" in diameter, through curved plates of magnesium about ⅜" thick, are now being economically produced without the use of jigs. First, a 5/16" hole is used as a pilot hole for a fly cutter. The total tolerance on the diameter of the accurately located holes is .001". According to Lockheed, "Fast, repetitive drilling is handled without the use and expense of jigs — heavy parts including castings are automatically positioned under the jig boring type spindle — parts handling is minimized — storage and maintenance of drill jigs are eliminated."



Where repeated accuracy of hole spacing, drilling, reaming and tapping is to be economically facilitated, the combination of the SUPER SERVICE PRECISION Drilling Machine and the Bullard 30" x 20" Spacer is hard to beat. Not only is production speeded — there is no waiting for jigs to be made. You can get into production of vitally needed parts right away.

Ask the Cincinnati Bickford Tool Company, of Cincinnati 9, Ohio, or the Bullard Company, of Bridgeport 2, Connecticut, for further information about this natural combination.

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9. Ohio U.S.A.**



"Our railroad bridge is an

EYE OPENER

for anybody with an assembly problem"

"Whether you're assembling toasters or bridges," Ken went on, *"it pays to set your sights on fasteners."*

"Fasteners?" asked Jack.

"Right!" affirmed Ken. *"We've saved plenty by taking the RB&W man's advice to switch from rivets to high strength RB&W bolts in assembling high stressed structural joints.*

"These bolts stay tight and that saves us maintenance. They assemble faster, and that saves us labor and construction time."

There's a cost-cutting lesson for you in this story, whatever your industry.* So look to your fasteners for an often overlooked opportunity to reduce costs, and strengthen your competitive position. New inventions, like RB&W's SPIN-LOCK Screw, may prove more efficient than the fasteners you're now using.** Or you may save by the stepped-up production you get from using the finest fasteners... RB&W bolts, nuts, rivets and screws of uniform accuracy, dependability and physical properties.

Let RB&W help you make the most efficient use of fasteners on your assembly line. Address RB&W at Port Chester.

RB&W—The Complete Quality Line. Plants at: Port Chester, N.Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents: Portland, Seattle. Distributors from coast to coast.

RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY

RB&W

107 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

*If you're interested in construction, write RB&W at Port Chester for the free article, "No More Riveting."

**New SPIN-LOCK Catalog is in the Product Design File. Write for extra copies.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the December, 1952, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

PIPE THREADS—Detroit Tap & Tool Co., 8615 8-Mile Road, Baseline, Mich. Manual C-52 presenting comprehensive design and gaging information and specifications for three standard pipe thread systems, as well as specifications for taper and straight pipe threads; thread plug and ring gages, and plain plug and ring gages. Tables of technical data are included. The manual is available when requested on business letter-head direct to the above address.

X-RAY ACCESSORIES AND SUPPLIES—Kelleket X-ray Corporation, 236 W. 4th St., Covington, Ky. Catalogue listing, illustrating, and describing a wide range of X-ray supplies essential to plants using radiography or fluoroscopy in nondestructive testing and examination of parts. Can be obtained if requested on a business letter-head to above address.

PLASTICS AND RESINS — Bakelite Company, a Division of Union Carbide and Carbon Corporation, 300 Madison Ave., New York 17, N. Y. Booklet entitled "Condensed Reference File of Bakelite and Vinylite Plastics and Resins," showing applications and finished products of more than fifty plastics. Can be obtained by business firms upon request to above address.

COPPER-BRASS ALLOY RODS — Copper and Brass Research Association, New York City. Handbook on copper-brass alloy rods, containing technical information of value to engineers and mechanics engaged in specifying and working with copper and copper alloy rod, including brass, bronze, and silver. A feature of the handbook is a comprehensive chapter on machining as it relates to copper and copper-brass alloys. 1

SHEET-METAL FABRICATING FACILITIES — Kirk & Blum Mfg. Co., Cincinnati, Ohio. Catalogue featuring parts and products manufactured by the company from galvanized and black sheet steel, a wide range of alloys, and plate up to 1/2 inch in thickness—the left-hand pages illustrating the facilities and the right-hand pages typical examples. 2

ALUMINUM—Reynolds Metal Co., Louisville, Ky. Catalogue entitled "1953 Reynolds Aluminum . . . Mill Products," explaining the increasing advantages of wrought aluminum alloys, and listing the company's aluminum mill products. An alloy selection guide, as well as information on fabricating and finishing aluminum, is included. 3

ABRASIVE-BELT MACHINES — Porter-Cable Machine Co., Syracuse, N. Y. Booklet 837-15M, descriptive of the complete line of Porter-Cable abrasive-belt machines. Operational pictures illustrate work done in the five types of abrasive-belt machining—platen, contact wheel, formed wheel, centerless, and flexible belt. 4

OIL HARDENING TOOL STEEL—DoAll Co., Des Plaines, Ill. Bulletin 52-803, giving information on ground flat stock—an oil hardening tool steel—made available by DoAll. Data is given on the metallurgical analysis of the steel and recommendations as to hardening, tempering, annealing, and grinding operations. 5

METAL STAMPINGS—Crosby Co., Buffalo, N. Y. A 24-page book entitled "How Crosby Metal Stampings Build and Protect Product Reputations," containing analyses of thirteen stamped parts and fabricated assemblies. The diversified equipment available for forming individual parts and fabricating complete assemblies is also described. 6

FOUNDRY SAND CONTROL—Claud E. Gordon Co., Chicago, Ill. Booklet entitled "Taking the Mystery Out of Foundry Sand Control," covering the selection of molding and core sands, the various physical properties, and their control. Recommendations for testing foundry sands and cores are given. 7

MACHINE TOOLS—Amtea Corporation (American Machine Tool Export Associates), New York City. Catalogue entitled "Amtea Index of Machine Tools," consisting of a guide to a number of different machine tools, segregated by classes and type of application. Spanish and Portuguese editions are available. 8

PERMANENT MAGNET SEPARATORS — S. G. Frantz Co., Inc., Trenton, N. J. Bulletin 75, providing information on the "FerroFilter" permanent magnet separator for the extraction of iron and steel particles and chips from circulating lubricating and hydraulic oils, coolants, and cutting compounds. 9

SILVER BRAZING—American Platinum Works, Newark, N. J. 48-page manual entitled "A Complete Guide to Successful Silver Brazing," treating all aspects of silver brazing applications and procedures. Available to engineering and brazing personnel of industrial manufacturers, schools, etc. 10

PRESS TYPE BRAKES—Cyril Bath Co., Cleveland, Ohio. Catalogue descriptive of Bath heavy-duty press type brakes for blanking, piercing, shallow draw, bending, trimming, punching, etc., at a standard production speed of forty-five strokes per minute. Specifications are given. 11

PLANETARY MILLING MACHINES—Hall Planetary Co., Philadelphia, Pa. Booklet descriptive of Hall planetary machines, which not only thread mill and form mill internally or externally, but also perform both operations in combinations simultaneously. Typical operations are shown. 12

INDUCTION HEATERS — Magnethermic Corporation, Youngstown, Ohio. Leaflet 1052, on 60-cycle low-frequency induction heaters —billet heaters, for extrusion presses and special heaters for many applications. 13

TUNGAR BULBS FOR RECTIFIERS — General Electric Co., Schenectady, N. Y. Manual GEA-5677, containing charts and graphs illustrating the characteristics, construction, operation, and application of G-E Tungar bulbs used for rectification of alternating current to direct current. 14

PRECISION CYLINDRICAL GRINDERS—Landis Tool Co., Waynesboro, Pa. Catalogue CG-53, describing and illustrating the complete line of Landis precision cylindrical grinding machines, including universal grinders, plain grinders, and single-purpose high production types. 15

MEASURING SURFACE ROUGHNESS — Micrometrical Mfg. Co., Ann Arbor, Mich. Bulletin L21, entitled "How to Specify Surface Roughness—and Why" in which the term "surface roughness" as applied to machined and finished surfaces is explained and the procedure outlined. 16

PERMANENT MAGNET ALLOYS—International Nickel Co., Inc., New York City. Pamphlet entitled "Nickel Containing Alloys for Permanent Magnets," explaining the advantages and limitations of commercially available permanent magnet alloys, especially the Alnico group. 17

RECORDING AND INDICATING INSTRUMENTS —Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Catalogue 1520, containing factual information concerning the company's line of "Electronik" recorders and indicators. 18

STEEL SHOP EQUIPMENT — Standard Pressed Steel Co., Jenkintown, Pa. Bulletin 839, describing the company's line of Hallowell steel shop equipment — steel work-benches, cabinet benches, multiple unit benches, and other accessories necessary in the shop. 19

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SINGLE-POINT CARBIDE TOOLS — DoAll Co., Des Plaines, Ill. Catalogue 52-817, on single-point "brazed on" carbide cutting tools and carbide tips and blanks. Information concerning proper use of the tools is included. 20

GRINDING WHEELS — Cincinnati Milling Machine Co., Cincinnati, Ohio. Booklet on Cincinnati grinding wheels for all types of precision grinding operations. A step-by-step picture story of how these wheels are manufactured is presented. 21

CIRCULAR SAWING MACHINES — Motch & Merryweather Machinery Co., Cleveland, Ohio. Leaflet descriptive of the circular sawing equipment built by the company for producing pieces accurate in length with a milled finish. 22

AIR AND HYDRAULIC DEVICES — Logansport Machine Co., Inc., Logansport, Ind. Booklet entitled "'The Facts of Life' on Air and Hydraulic Devices," presenting information on the installation and maintenance of air and hydraulic equipment. 23

WELDING — Air Reduction, New York City. Booklet ADC 717-B, describing the equipment and supplies employed in Aircomatic welding —an inert-gas shielded metal-arc process for the welding of the generally hard-to-weld metals. 24

RULES OF LINCOLN UNDERGRADUATE AWARDS — James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Rules and conditions booklet for the annual engineering undergraduate award and scholarship design program of the Foundation. 25

SIGNALING TEMPERATURE CONTROLLERS— Thermo Electric Co., Inc., Fair Lawn, N. J. Catalogue Section 55, describing a signaling temperature controller of the resistance bulb type, for use with ovens, tanks, injection molding machines, etc. 26

SPEED REDUCERS — Cleveland Worm & Gear Co., Cleveland, Ohio. Booklet entitled "Clevelands — at Work," giving on-the-job studies illustrating the performance of Cleveland worm-gear speed reducers in diversified industries. 27

HORIZONTAL PRESS—Clearing Machine Corporation, Chicago, Ill. Bulletin 219, descriptive of the Clearing double-end horizontal press, explaining how it cuts costs and speeds production of cartridge cases and similar work. 28

SELF-TAPPING SCREWS — Parker-Kalon Corporation, New York City. Booklet entitled "Users' Guide," which may be used as a wall chart for easy reference to technical information on "where to use what screw." 29

METAL CLEANING—E. F. Houghton & Co., Philadelphia, Pa. Manual entitled "Houghton Handbook on Metal Cleaning," containing data on methods and products relating primarily to cleaning metal parts in defense industries. 30

X-RAY THICKNESS GAGES—Sheffield Corporation, Dayton, Ohio. Catalogue MY-52-3 on the "50" series Sheffield Measuray a non-contact X-ray gage for continuous or intermittent thickness measurement of strip or sheet stock, moving or stationary. 31

BLAST CLEANING AND DUST COLLECTION— Pangborn Corporation, Hagerstown, Md. Booklet comprising one section on the company's line of small standard units for blast cleaning, and another for dust collection applications. 32

RECOVERY OF METALS—Permutit Co., New York City. Reprint entitled "Metal Recovery by Ion Exchange," giving technical data on the recovery of industrially important metals from dilute solutions. 33

CUTTING TOOLS—Threadwell Tap & Die Co., Greenfield, Mass. 48-page catalogue covering the company's complete line of cutting tools, including taps, dies, twist drills, counterbores, and keyway broaches. 34

HEAT-TREATING FURNACES—Lindberg Engineering Co., Chicago, Ill. Bulletin 131, containing photographs, diagrams, and specification charts on all types of Lindberg gas-fired and electric Super Cyclone furnaces. 35

TACHOMETERS—Bristol Co., Waterbury, Conn. Bulletin S1402, showing methods of application, reproductions of actual chart records, and dimensions of the full line of Bristol recording and indicating electric tachometers. 36

HYDRAULIC BULLDOZERS — Lake Erie Engineering Corporation, Buffalo, N. Y. Bulletin describing hydraulic bulldozers for hot and cold bending and forming operations. Pictures of typical installations are given. 37

MEASURING INSTRUMENTS — Webber Gage Co., Cleveland, Ohio. Leaflet describing the "Temp-Check"—a portable device for measuring the temperature of metals, liquids, or air without waiting for blocks of work to "cool off" before making the inspection. 38

TRANSFER MACHINE—Avey Drilling Machine Co., Cincinnati, Ohio. Folder describing the Avey twelve-station Line-O-Dex transfer machine, and showing drilling operations performed by the machine. 39

CLAMPS — DoAll Co., Des Plaines, Ill. Form 51-809, describing the company's universal clamps, and illustrating their wide range of application to machine tools. 40

ROLLER GEAR DRIVES — Ferguson Machine & Tool Co., Inc., Ferguson, Mo. Leaflet describing Ferguson roller gear drives for high-speed intermittent motions on automatic machines. 41

ADJUSTABLE WRENCHES—Utica Drop Forge & Tool Corporation, Utica, N. Y. Folder giving practical advice on remedies for long-used adjustable wrenches. 42

TOOL- AND DIE-MAKERS' ACCESSORIES — Producto Machine Co., Bridgeport 1, Conn. Catalogue descriptive of dowel-pins, die springs, stripper bolts, and cap-screws for tool-room use. 43

PERFORATIONS — Erdle Perforating Co., Inc., Rochester 11, N. Y. Catalogue containing photographs of various style perforations in actual use, such as a machine guard, grille work in a manufactured product, etc. 44

CHROMIUM-CARBIDE GAGE BLOCKS—Webber Gage Co., Cleveland, Ohio. Folder descriptive of Crobiox — a gage block made from a chromium-carbide alloy with the same expansion rate as steel. 45

ROD AND ELECTRODE CHART — All-State Welding Alloys Co., Inc., White Plains, N. Y. Wall chart designed to aid welders in the selection of the particular All-State alloy and flux for the job at hand. 46

FLEXIBLE SHAFT GRINDER—Spring Specialty Co., Maywood, Ill. Bulletin 50G, descriptive of the Leigh LG 3 high-speed grinder, a small flexible shaft grinder for light production work. 47

WORK-HOLDING EQUIPMENT — Rolock Inc., Fairfield, Conn. Catalogue B-9, giving many examples of baskets, racks, tanks, etc., for use in metal-working plants, built to customers' specifications. 48

BALANCING MACHINE—Kurt Orban Co., Inc., New York City. Booklet describing the balancing principle of the Trebel dynamic balancing machine, and explaining how it operates. 49

PRESSES—Famco Machine Co., Kenosha, Wis. Catalogue on the complete Famco line of presses — air, power, arbor, drill, and foot types; band saws; and squaring shears. 50

REVERBERATORY FURNACES — Eclipse Fuel Engineering Co., Rockford, Ill. Catalogue C-90 on the Eclipse Sklenar reverberatory furnace for the melting of iron, brass, aluminum, etc. 51

GRINDERS — Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass. Bulletin 84A, descriptive of the Rivett Model 84 small hole grinder, which may also be equipped for cylindrical grinding. 52

DROP-FORGED TOOLS—J. H. Williams & Co., Buffalo, N. Y. Catalogue covering the entire line of Williams tools, such as carbon and alloy wrenches, detachable and impact sockets, tool-holders, etc. 53

CHAIN SHEAVE SELECTOR — David Round & Son, Cleveland, Ohio. Slide chart containing specification data pertaining to pocketed chain sheaves and chain. 54

LUBRICATORS—Hills-McCanna Co., Chicago, Ill. Catalogue L-52, describing the company's open and enclosed type force feed lubricators for all types of machinery. 55

DEHYDRATORS—Selas Corporation of America, Philadelphia, Pa. Bulletin on Selas dehydrators for continuous removal of water vapor from air and other gases. 56

TRANSFORMERS—Hevi Duty Electric Co., Milwaukee, Wis. Bulletin T-5111, describing dry type circuit transformers for machine tool and industrial controls. 57

FLEXIBLE TUBING—Flexible Tubing Corporation, Guilford, Conn. Catalogue C2-3, showing various applications of flexible ducting by industry. 58

Product Information Service

Use the postage-free postcard below for requesting further information on New Catalogues. Simply circle the numbers of the items in which you are interested. Please print your name and address.

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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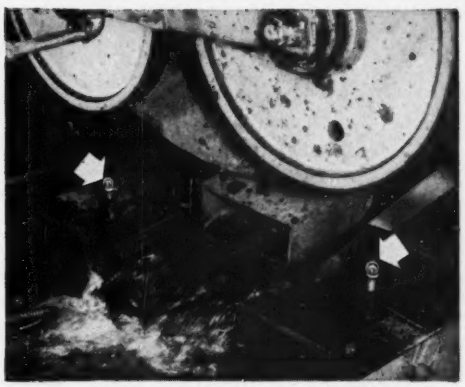
Firm.....

Street.....

City.....Zone.....State.....

This card is void after March 1, 1953

12 months "Snorkel" duty... and still in excellent condition



↑ Relubrication fittings for Fafnir Pillow Blocks are indicated by arrows. Once-a-week lubrication plus Fafnir Mechani-Seals protect submerged bearings.

↓ Complete installation shows relubrication fitting, pipe and Fafnir Pillow Block.



Standard Fafnir Ball Bearing Pillow Blocks

On a conveyor used for lifting steel balls from the water quench bath of a rotary type furnace are two 1½" Fafnir LAK Type Ball Bearing Pillow Blocks. These bearing units, running at 2-3 r.p.m., are three feet under water. The water bath has a pH of about 6 and a temperature automatically controlled at 90°F.

After 12 months of operation at 16 hours a day, 6 days a week, the pillow blocks were removed for inspection. Their condition is shown in the unretouched photograph below. According to a maintenance report, both the pillow blocks and bearings were in excellent condition and suitable for further service.

This application may help you to find a better, cheaper way to use bearings. Although it's unusual . . . it serves to demonstrate the multiple-uses of Standard Fafnir Ball Bearing Units plus their ability to operate efficiently under extreme conditions. Whatever your bearing problem, a few minutes spent with a Fafnir representative may help you solve it as successfully. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

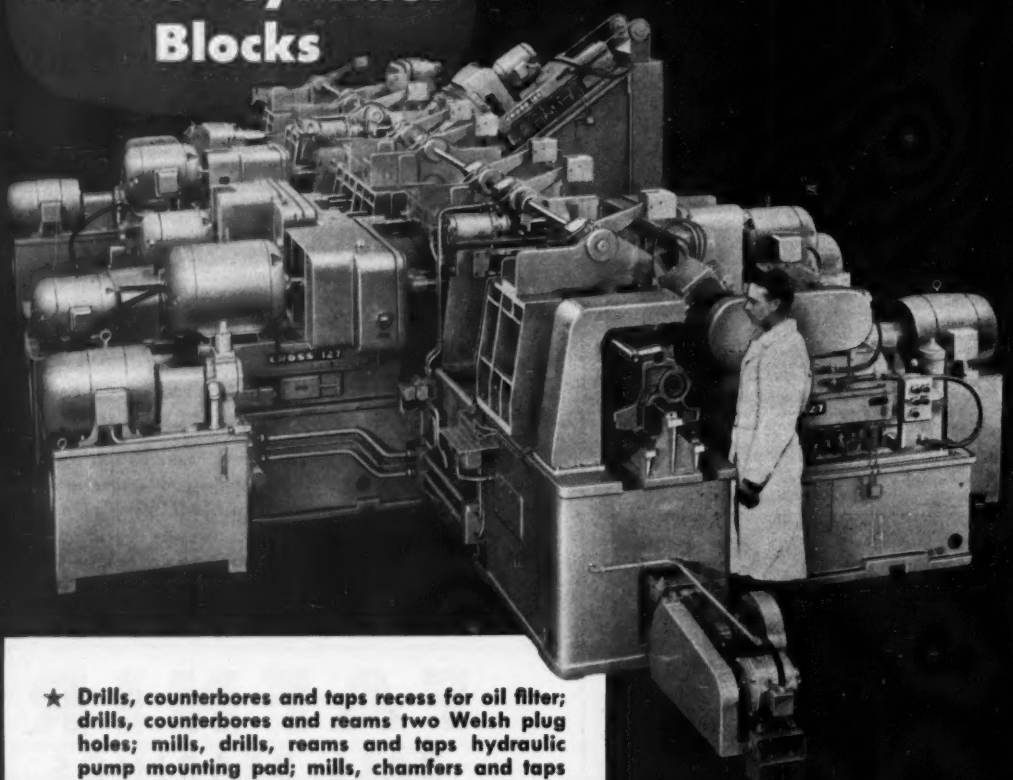
MOST COMPLETE LINE IN AMERICA



Unretouched photograph of Fafnir Pillow Blocks, one disassembled, shows condition after 12 months operation 3 feet under water.

Mills, Drills, Bores and Taps Tractor Cylinder Blocks

Another Transfer-matic by Cross



- ★ Drills, counterbores and taps recess for oil filter; drills, counterbores and reams two Welsh plug holes; mills, drills, reams and taps hydraulic pump mounting pad; mills, chamfers and taps all miscellaneous holes on both sides.
- ★ 71 pieces per hour at 100% efficiency.
- ★ 13 stations—one for loading; one for milling; six for drilling, boring and reaming; one for tapping; four for inspection.
- ★ Hydraulic power operated transfer mechanism moves work from station to station.
- ★ Other features: Construction to J.I.C. standards; automatic chip conveyor; automatic air-oil tap lubricating and cleansing with each cycle; automatic, gravity operated cam clamping; automatic retraction for milling cutters during return stroke.

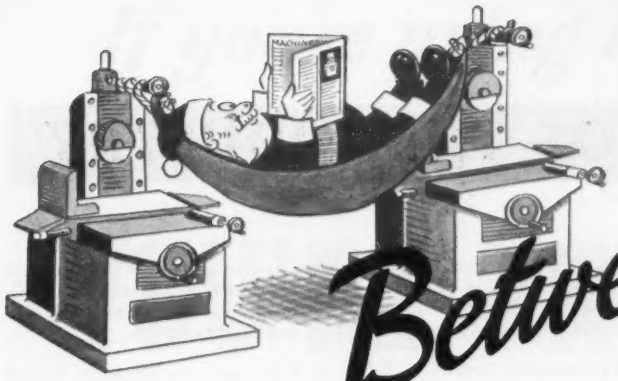


Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS



Between Grinds

By E. S. Salichs

Move Over, Kris!

Putting Kringle in the hammock was not lightly done. Truth is we hope you will have such a Merry and Gay Christmas and New Year that you will spend some well-needed leisure lounging—with MACHINERY in your hands, too!

Pinched and Blue, Too?

A chart composed by the Utica Drop Forge & Tool Corporation depicts the "Family Tree of Common Pliers." The basic pliers are grouped genealogically by their noses—short noses, long noses, straight, bent, etc. In fact, the sort of thing that might easily distinguish anybody's family tree.



Proof Please

Sealtest will shortly demonstrate to visitors the latest improvements in the art of ice cream making in its new Pittsburgh plant that makes full use of the principles of straight line production. Let's get on with the sampling!

Level Quivers as Earth Quakes

A technician, Hans Lindquist, in the tool inspection laboratory at the Timken Roller Bearing Co., recently detected an earthquake while working with a Starrett master precision level which he was adjusting on a precision grinder. Hans, namesake for a well-known fairy tale teller, made sure of his story by verifying that the seismograph at the John Carroll University in Cleveland had recorded earth tremors 5000 miles away in the Japanese islands at precisely the time that he had noted the reaction of the precision level.



Ceylon Mix

From a workshop in Ceylon stems this letter: "In coming across of a tablet appeared in news of the MACHINERY'S HANDBOOK, and my mind of sound mechanical turned out to procure a book." Our order department, of mind sound financial, sent the correspondent the information he wanted, i.e., the price for same.

Blow to the Space Man

Arma Corporation's senior engineer explains in an article in *Aero Digest* how a child's spinning top may replace the military pilot in the supersonic future. (The top, or gyroscope, maintains its attitude in space regardless of outside disturbing influences.)

Balm in the Ball

A golf ball is now on the market which uses honey for its liquid center. However, it lays no claim to sweetening the golfer's vocabulary or soothing his feelings as the ball circles the cup.

"In Union . . ."

Labor and capital may not see eye to eye and on occasion take the opportunity to tell each other so, but comes a happy event such as the Fiftieth Anniversary of the National Machine Tool Builders' Association, and mutual regard springs to the fore. The UE Local 218 and one other in the vicinity of Springfield and Windsor, Vt., helped to celebrate Machine Tool Progress week which resulted from publicity MACHINERY initiated in conjunction with our N.M.T.B.A. Golden Anniversary number published in October.



News OF THE INDUSTRY

California and Washington

CLYDE W. SEYMOUR has been named assistant manager of the manufacturing division of the Solar Aircraft Co., San Diego, Calif. Mr. Seymour was formerly manager of the production control department, and this position will be filled by W. ROBERT BRUCE.

MARVIC, INC., San Mateo, Calif., has been organized to manufacture a toolholder formerly made by Lebo Industries, San Francisco, Calif. The new firm is located at 350 Peninsular Ave., San Mateo.

LINDBERG STEEL TREATING CO., Chicago, Ill., recently tripled the capacity of its Los Angeles, Calif., plant located at 2910 Sunol Drive.

CARL E. SWIFT, Los Angeles, Calif., has been appointed distributor of specialty tool steel products for the Jessop Steel Co., Washington, Pa.

HARVEY H. MORRISON has joined the Stillman Rubber Co., Culver City, Calif., as vice-president in charge of production.

SIERRA DRAWN STEEL CORPORATION, Los Angeles, Calif., has established a cold-finishing bar mill in Seattle, Wash. The new subsidiary occupies over six acres, and will be known as the SIERRA DRAWN STEEL CORPORATION OF THE NORTHWEST.

Illinois and Indiana

ANDREW L. PONTIUS has been named works manager for the Shakeproof Division, Illinois Tool Works, Chicago, Ill. In this capacity, Mr. Pontius will direct all manufacturing and processing activities of the Division's plants located in Elgin and Des Plaines, Ill. E. E. VALY has been named by the company as distributor sales manager for Illinite standard cutting tools. Mr. Valy, who has been associated with the Illinois Tool Works for thirty-three years, will maintain headquarters at the Chicago plant.

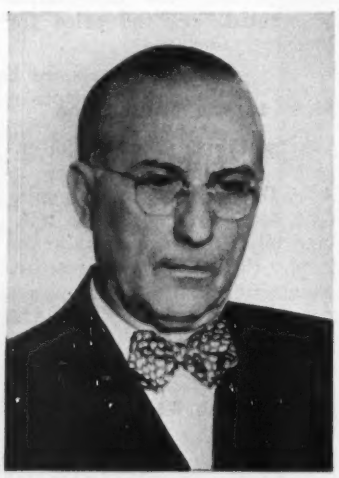
JAMES M. MEAD was recently elected assistant vice-president of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Mead joined the company in 1919, and after a period of sales work served as manager of the Philadelphia plant and later the New York City plant. This past year Mr. Mead was appointed first assistant to the vice-president in charge of purchasing, procurement, and merchandising, his headquarters being in Chicago.

HANNA ENGINEERING WORKS, Chicago, Ill., recently announced the appointment of the following representatives: HALDEMAN-LANGFORD, 2580 University Ave., St. Paul, Minn., to handle sales in Minnesota and northwestern Wisconsin; and SCOTT EQUIPMENT & ENGINEERING CO., 54 W. 30th St., Indianapolis, Ind., to distribute products in central and southern Indiana and northern Kentucky.

THOMAS F. MACLAREN has been appointed representative in the Chicago, Ill., office of Brown & Sharpe Mfg. Co., Providence, R. I., succeeding HOWARD K. JACKSON, who has been given a special assignment. Mr. MacLaren was manager of the Los Angeles, Calif., office of the company at the time of his appointment.

J. E. MULLEN is joining Brad Foote Gear Works, Inc., Chicago, Ill., gear manufacturers, as regional sales representative in Ohio and Pennsylvania. Mr. Mullen was formerly vice-president in charge of sales at the National Erie Corporation, and is widely known in the steel industry.

HARRY T. KESSLER, executive vice-president of the Tuthill Pump Co., Chicago, Ill., has been made president and treasurer of the company. The former president, G. B. TUTHILL, is now chairman of the board. N. G. TUTHILL has been elected vice-president and secretary.



Harry T. Kessler, new president and treasurer of the Tuthill Pump Co.

A & A TOOL AND MACHINE WORKS announces that it has been incorporated under the name of A & A MACHINE CO., and will continue the manufacture of special machinery, tools, dies, and precision parts in Chicago, Ill.

R. F. LEDFORD has joined the Industrial Filter & Pump Mfg. Co., Chicago, Ill., as director of sales and research. Mr. Ledford was formerly associated with the Sunbeam Corporation.

LANDON C. FUQUA has been named sales representative by the Standard Pressed Steel Co., Jenkintown, Pa., and has been assigned to the Chicago, Ill., office.

EMIL HOLZWART has been made production manager of the General Box Co., Des Plaines, Ill., filling the vacancy caused by the recent death of D. F. HAHN.

SIGMUND TOTH has become shop superintendent of the Beatty Machine & Mfg. Co., Hammond, Ind., and JOHN BORKERT has been named chief engineer.

Massachusetts

L. S. STARRETT CO., Athol, Mass., announces the following changes in sales personnel: THOMAS R. GRIFFITH, previously with the New York City office, has been transferred to northeastern Pennsylvania and south central New York, replacing CLYDE STARRETT, who has been transferred to the home office; TUDOR GARLAND has been assigned to the New York City office; WALTER CLARK has been appointed to north central New York; and HAROLD E. SHERWOOD, JR., has been made representative in Louisiana, Mississippi, and south Texas, replacing ROBERT F. WEINTRITT, who has resigned. FREDERICK CLARKSON has joined the company as assistant to the advertising manager.

GEORGE A. PARK, sales manager for the eastern region of the Norton Co., Worcester, Mass., has been appointed manager of distributor sales, a newly created position. DONALD L. PRICE,

If you're using high-priced quenching oils

YOU'RE PROBABLY WASTING MONEY!

Verified reports from a great many heat-treating plants prove conclusively that they have saved money by switching from an expensive quenching oil to a Sun Quenching Oil. In every instance these plants have maintained—or surpassed—their standards of quality through the use of Sun's specially refined naphthenic quenching oils.

These are facts—not idle boasts. If you would like to see field reports giving the details of these plants' quenching operations, and the benefits they obtain, fill in the coupon below.

Sun Quenching Oils can handle 95 percent of all quenching jobs

1 They cost less. You save on the purchase price.

2 They have low drag-out. When heated they thin out more than paraffinic oils, draining off parts more rapidly. You reduce your operating costs.

3 They keep systems clean. Because of their natural detergency, the tank and system stay clean. Coolers keep operating at peak efficiency.

4 They have long life. Sun Quenching Oils do not thicken up in service, and under normal operating conditions, they need never be replaced.

5 They assure a uniform rate of cooling. These oils have excellent metal-wetting characteristics. They do not lose quenching speed after extended use.

Dept. M-12

SUN OIL COMPANY, Phila. 3, Pa.

Perhaps I *am* paying too much for quenching oil. ☐ I'd like a Sun Representative to show me field reports of other companies' experience with Sun Quenching Oils. ☐ Please send me the informative booklet "Sun Quenching Oils."

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®







(Left to right) William J. Pinkerton, new vice-president in charge of manufacturing at the Micromatic Hone Corporation; Arthur B. Kowalski, factory manager; and Myron P. Ellis, advertising manager

who was sales manager of the central region, will also assume responsibility for the eastern region.

DU MONT CORPORATION recently moved into its new plant in Greenfield, Mass., which doubles the production capacity of "Minute Man" keyway broaches and other du Mont tools.

JAMES D. CASEY was recently elected vice-president in charge of engineering by Bolta Co., Lawrence, Mass., manufacturer of plastic products.

Michigan and Wisconsin

NEIL A. MOORE has been elected president and a member of the board of directors of the F. L. Jacobs Co., Detroit, Mich., automotive parts manufacturer, replacing CLARE S. JACOBS, the retiring president. Mr. Moore was previously a vice-president of the Federal-Mogul Corporation.

DETROIT DIE SET CORPORATION, Detroit, Mich., recently announced the appointment of the following representatives: FRANK L. SHOEMAKER Co., 4036 34th Ave. West, Seattle, Wash.; and CHARLES W. BRINGMAN, 310 Orlando Ave., Orlando, Fla.

HARRY DAY, general manager of the Link Welder Corporation, Detroit, Mich., was recently named vice-president. He will continue his duties as general manager.

MICROMATIC HONE CORPORATION, Detroit, Mich., announces the following staff appointments: WILLIAM J. PINKERTON, formerly director of public and industrial relations, is promoted to the position of vice-president in charge of manufacturing; ARTHUR B. KOWALSKI, becomes factory manager, the position formerly held by the late HERMAN THALER; MYRON P. ELLIS is named advertising manager; and JOSEPH BOLZ and GLENN ROSENE are appointed division superintendents.

CLECO DIVISION OF REED ROLLER BIT Co., Houston, Tex., manufacturer of portable air tools, has opened a sales office and service plant at 18071 Wyoming Ave., Detroit 21, Mich. B. O. STOOTHOFF is division manager.

E. C. FREEMAN has been made factory manager of the Trenton, Mich., plant of the Chrysler Corporation, Detroit, Mich. Mr. Freeman has been associated with the corporation since 1924.

REZOLIN, INC., manufacturer of Rezoline Tool-Plastik, has moved into larger quarters at 19368 James Couzens Highway, Detroit, Mich.

MONTGOMERY ENGINEERING Co. has moved from 14101 Prairie, in Detroit, to new quarters at 8500 Twelfth, Detroit 6, Mich.

GEORGE CHIPLEY was recently appointed representative in Wisconsin by the Conoflow Corporation, Philadelphia, Pa., manufacturer of pneumatic final control elements. Mr. Chipley will have his headquarters in Milwaukee.

Missouri and Oklahoma

WENDT-SONIS Co., Hannibal, Mo., producer of carbide-tipped cutting tools, has expanded its plant with an addition that doubled the manufacturing area.

PETE E. WALKER has been appointed industrial sales engineer with headquarters in St. Louis, Mo., for the Parker Appliance Co., Cleveland, Ohio.

RELIANCE ELECTRIC & ENGINEERING Co., Cleveland, Ohio, has appointed SMITHCO ENGINEERING as sales representative in Oklahoma. Smithco Engineering is located at 3348 S. Erie St., Tulsa, Okla.

New Jersey

ROBERT S. SWEENEY was recently named vice-president and general manager of the Watson-Stillman Co., the Hydraulic Press Division of H. K. Porter Co., Pittsburgh, Pa. Mr. Sweeney will be in charge of manufacturing and sales activities of the Division, at Roselle, N. J.

PARKER RUST PROOF Co., Detroit, Mich., has opened a manufacturing plant at Mountain View, N. J., to serve the East Coast. The company's eastern office, formerly located in New York City, is now being transferred to Mountain View.

JAMES T. DUFFY, JR., has been elected executive vice-president of the Camden Forge Co., Camden, N. J. Mr. Duffy was formerly president of the Riverside Metal Co., from which company he resigned this spring.

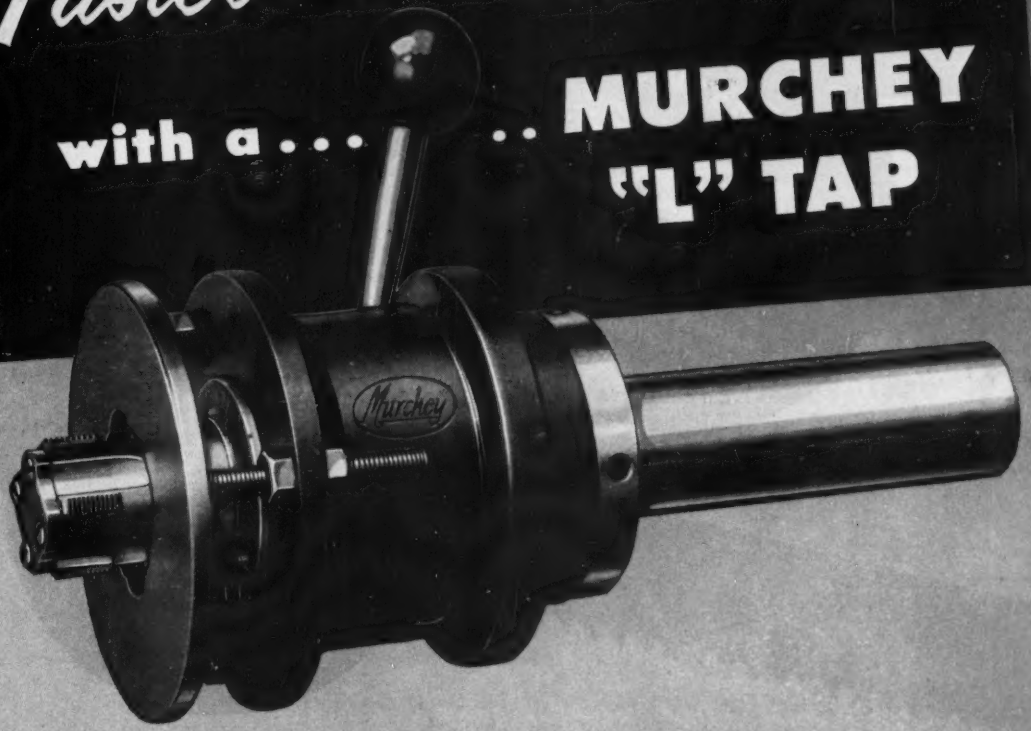
RELIANCE ELECTRIC & ENGINEERING Co., Cleveland, Ohio, announces the removal of its Newark sales office from 1060 Broad St. to 535 High St., Newark, N. J.

JOHN G. HOLSCHUH has been named manager of the newly created market research section of Elastic Stop Nut Corporation of America, Union, N. J.

(This section continued on page 253)

BETTER THREADS *Faster* and for *Less Money*

with a . . . MURCHEY "L" TAP



If your tapping operations include artillery shells or similar work where holes range from 1⅛" to 6¾", the Murchey Type "L" Taps are a natural.

POSITIVE RETRACTION: Chasers are pulled clear of the cut to collapse the tool at the end of the tapping cycle.

BETTER THREADS: The solidly anchored chasers cut full depth and with perfect uniformity.

ACCURATE PITCH DIAMETER: Diameter is accurately adjusted or changed in a matter of seconds without removing the tool from the machine.

NO CHIP TROUBLE: Pitch diameter adjustment and chaser assembly are sealed against the entrance of dirt and chips.

MAINTENANCE NEGLIGIBLE: The oversize plunger spring normally lasts for the full life of the tap. The positive sealing at both ends excluding chips and dirt protects internal members against abrasion.

For details on this and other Murchey threading tools contact your Murchey representative or write to us directly.

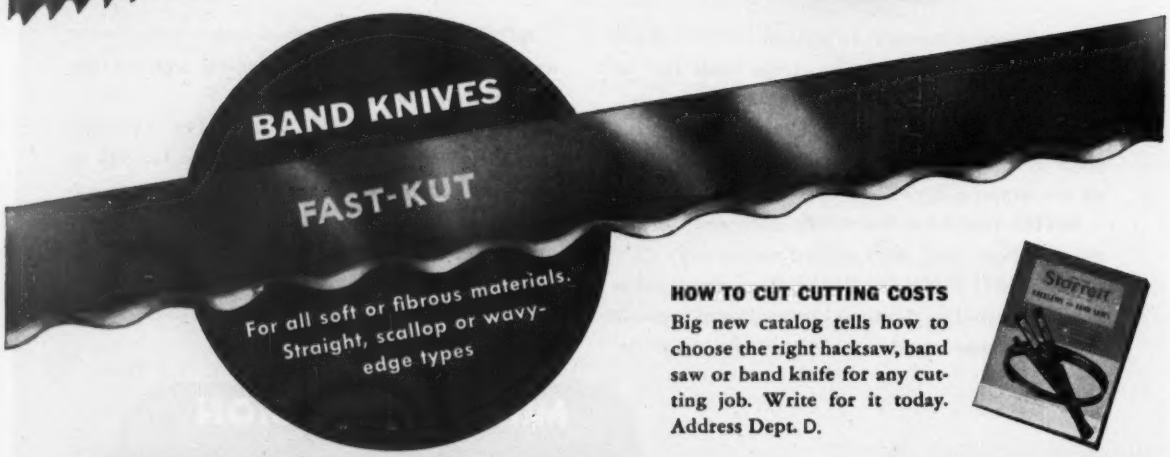
MURCHEY DIVISION
OF THE
SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

FOR MORE CUTS PER DAY MORE CUTS PER BLADE

Specify **Starrett**







HOW TO CUT CUTTING COSTS

Big new catalog tells how to choose the right hacksaw, band saw or band knife for any cutting job. Write for it today. Address Dept. D.

STARRETT TOOLS

TRADE MARK **Starrett** REG U S PAT OFF

SINCE 1880
WORLD'S GREATEST TOOLMAKERS



THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

MACHINERY'S DATA SHEETS 719 and 720

AMERICAN STANDARD FOR ACCURACY OF ENGINE AND TOOL-ROOM LATHES—5

Test	Recommended Standards			
	Tool-Room Lathes	Engine Lathes		
		12 to 18 Inches, Inclusive	20 to 32 Inches, Inclusive	40 to 72 Inches, Inclusive
Lathe must turn round with work mounted in chuck	0.0003	0.0004	0.0008	0.001
Lathe must turn cylindrical within 0.002 inch on a 12-inch length of work-piece mounted in a chuck	0.0003	0.0015	0.002	0.002
Lathe must turn cylindrical within 0.002 inch on a 12-inch length of work-piece mounted on centers	0.0004	0.0008	0.001	0.001
Lead-screw				
Lead per foot	±0.0010	±0.0015	±0.0020	±0.002
Lead in any 4 inches	±0.0004	±0.0005	±0.0007	±0.001
Backlash				
On cross-feed screw	0.004	0.004	0.005	0.005
On compound-rest screw	0.004	0.004	0.005	0.005

MACHINERY'S Data Sheet No. 719, December, 1952

Approved by American Standards Association as B5.16—1952

RECOMMENDED CONDITIONS FOR SPOT-WELDING SOME COMBINATIONS OF DISSIMILAR METALS

Combination of Metals	Thickness, Inch	Electrode* Size, Inch	Electrode Force, Pounds	Welding Time, Cycles of 60-Cycle Current	Welding Current, Amperes	Minimum Overlap, Inch	Minimum Weld Spacing, Inches	Diameter of Fused Zone, Inch	Shear Strength, Pounds per Square Inch
Nickel and mild steel	0.063	5/16	1500	10	16,200	5/8	1 1/4	0.25	2200
Nickel and low-alloy steel (8630)	0.063	5/16	1500	10	14,500	5/8	1 1/8	0.25	2350
Nickel and stainless steel (18-8)	0.063	5/16	1800	12	16,000	5/8	1 1/8	0.25	2700
Nickel and Monel	0.063	5/16	2000	12	20,000	5/8	1 1/4	0.28	2900
Nickel and Inconel	0.063	5/16†	2500	12	15,500	5/8	1 1/8	0.26	2750
Monel and mild steel	0.063	5/16	1600	14	17,500	5/8	1 1/4	0.25	2300
Monel and low-alloy steel (8630)	0.063	5/16	1600	14	16,800	5/8	1 1/8	0.25	2450
Monel and stainless steel (18-8)	0.063	5/16	1800	14	16,000	5/8	1 1/8	0.25	2800
Monel and Inconel	0.063	5/16	2300	14	15,500	5/8	1 1/8	0.25	3000
Inconel and mild steel	0.063	5/16	1600	14	17,000	5/8	1 1/4	0.23	2200
Inconel and low-alloy steel (8630)	0.063	5/16	1600	14	16,000	5/8	1 1/8	0.25	2300
Inconel and stainless steel (18-8)	0.063	5/16	2500	16	14,000	5/8	1 1/8	0.28	2950
Stainless steel (18-8) and mild steel	0.063	5/16	1600	14	18,000	5/8	1 1/4	0.25	2170
Stainless steel (18-8) and low-alloy steel (8630)	0.063	5/16	1600	14	17,500	5/8	1 1/8	0.26	2400

*Class II electrodes, 3-inch dome radius.
†Class III electrode against nickel sheet.

MACHINERY'S Data Sheet No. 720, December, 1952

Compiled by the International Nickel Co., Inc., New York City

SAVE TIME, INCREASE PRODUCTION

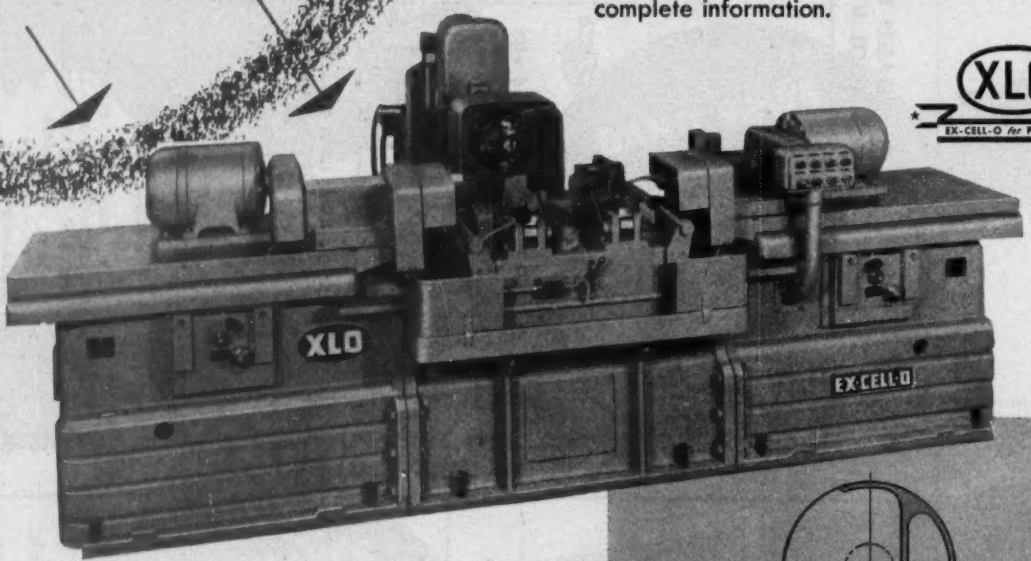
with EX-CELL-O WAY MACHINES

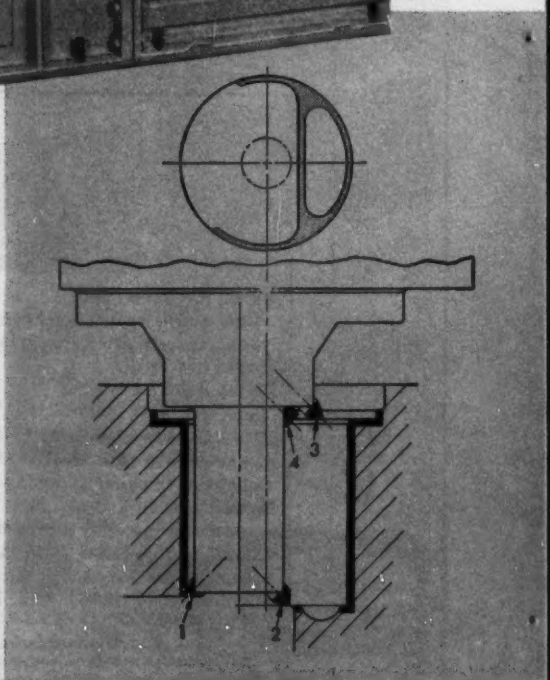
Ex-Cell-O Way Machines save time by working from 2, 3, or 4 directions simultaneously, holding accurate relationship between the various operations. Standard, self-contained way units can be rearranged for different work, using units individually or combined with others.

This Three-Way Precision Boring Machine uses three standard way units. The two side units perform conventional boring, plunge-facing and chamfering operations on holes approximately 3 inches in diameter. The rear station performs more complicated work requiring a cross-feed head (see drawing). The bore diameter at the rear station is 4 inches, and is held to limits of plus or minus .0005".

Ask your Ex-Cell-O representative for complete information.

XLO
EX-CELL-O for PRECISION





Right: Tool layout for roughing operations at the rear station. Tool 1 bores the hole as the table feeds forward to a positive stop. Then the cross-feed head moves across while tool 2 faces an area at the base of the bore and tool 3 faces the shoulder of the counterbore. As the cross-feed slide approaches the end of its stroke tool 4 chamfers the edge of the bore. The table then reverses in feed until tool 2 blends its cut with the bore produced by tool 1, and tool 3 bores the counterbore, after which both table and cross-feed head return to the start position. The upper drawing is a view looking into the hole. The circle in broken lines shows the path of tool 2 while tool 1 is boring. The shaded portion is the area faced by tool 2.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • DAIRY EQUIPMENT
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS

52-27

New York

AARON EVANS has been named Detroit, Mich., sales manager by the Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y. He succeeds ALFRED FAIRFIELD, who recently retired. Prior to his promotion, Mr. Evans represented the company in Chicago, Ill. Also announced was the appointment of LAMBERT M. KASPERS, as manager of the Coraopolis, Pa., plant, replacing MATTHEW L. DOUGLAS, who also retired. Mr. Kaspers was formerly located at the Rock Falls, Ill., plant.

F. W. GOTTSCHLING, JR., has rejoined Greer Hydraulics, Inc., Brooklyn, N. Y., in the capacity of administrative engineer and assistant to the president. Mr. Gottschling was recently associated with two Californian concerns although he had formerly been with Greer. LEONARD H. SEEMAN has become production manager in the Industrial Division. Also announced was the appointment of SUMNER L. BARTON to the position of general district manager at Chicago, Ill.

HAROLD C. SMITH, JR., has been assigned to the post of manager, rail and government sales, by the Carborundum Co., Niagara Falls, N. Y. Mr. Smith was formerly manager of the central zone of the company's merchandising sales division. In his new capacity, he will be responsible for sales of abrasive products to agencies of the Government and to the railroad industry.

O. B. J. FRASER, assistant manager of the Development and Research Division, International Nickel Co., Inc., New York City, recently received the Samuel Wylie Memorial Medal, a presentation made by the American Welding Society at its annual meeting. Mr. Fraser was so honored because of his studies of field applications and promotion of welding research.

H. L. WEINBERG, chief engineer of the American Locomotive Co., Schenectady, N. Y., has been promoted to the position of director of engineering. He will take over the duties of JOHN THOMAS, who has been assigned to the administrative staff. KENDALL B. ROWELL becomes chief engineer in Mr. Weinberg's stead.

DOUGLAS R. G. WILLIAMS has joined the Manufacturing Division of the Arma Corporation, Brooklyn, N. Y., subsidiary of the American Bosch Corporation. In his new position, Mr. Williams will act as staff assistant for the Division.

MACAULEY MACHINERY CO. has moved from Schenectady, N. Y., to the Sibley Tower Bldg., Rochester 4, N. Y. The company represents the HARTFORD SPECIAL MACHINERY CO., Hartford, Conn., in the Rochester, Schenectady, and Syracuse area.

TEMPLETON, KENLY & CO., Chicago, Ill., manufacturers of mechanical and hydraulic jacks, announce that their New York offices have been consolidated, and will be located at 60 E. 42nd St., New York City. E. A. ZIMMERMAN will be in charge.

EMERY B. KEREKES was recently named assistant to the vice-president of Hydropress, Inc., and its subsidiary, the Loewy Construction Co., Inc., New York City, builders of heavy hydraulic machinery and rolling mills.

MATHEMATICAL COMPUTING SERVICE, 105 Court St., Brooklyn, N. Y., has been organized as a service for industries and universities desiring engineering calculations of a high degree of complexity.

Ohio

LEES-BRADNER CO., Cleveland, Ohio, manufacturer of hobbing and threading machinery, announces the appointment of the following dealers: OSBORNE MACHINERY CO., 880 Harrison St., San Francisco, Calif.; SWANSON MACHINERY CO., 1422 Lake Drive, Southeast, Grand Rapids 6, Mich.; and KLATT & CO., 329 Twentieth St., Toledo 2, Ohio.

HARRY L. JENTER, chief engineer of the American Steel and Wire Division, United States Steel Co., Cleveland, Ohio, has been promoted to the position of assistant district manager for the Cleveland district. In his new post, he will be concerned with the operations of the Division's facilities in this area.

ROLLIN D. HAGER has been appointed general manager of industrial products manufacturing for the B. F. Goodrich Co., Akron, Ohio. Mr. Hager was formerly general superintendent for the industrial products division, and the position he vacated will be filled by LEE D. TIDBALL, who was production superintendent.

FLUID CONTROLS, INC., Willoughby, Ohio, has recently moved to its new plant located at 1284 N. Center St., Mentor, Ohio. The company's mailing address is Box 24, Mentor.

JOHN W. BROPHY has become works manager of the Cleveland Diesel Engine Division, Cleveland, Ohio, of the General Motors Corporation.

JOHN E. GIERE has been appointed to the Cleveland, Ohio, regional sales staff of the Udylite Corporation, Detroit, Mich.

DANIEL T. WELLMAN has been promoted to the presidency of the Wellman Bronze & Aluminum Co., Cleveland, Ohio, while his father, F. S. Wellman, who was president, becomes chairman of the board.

WILLIAM S. WHEELER and ROBERT BRADY have organized the firm of WHEELER-BRADY, INC., and will specialize in consulting engineering services. The new firm is located at 15017 Detroit Ave., Cleveland, Ohio.

TERRY MACHINERY CO. has been appointed northeastern Ohio representative for the DETROIT DIE SET CORPORATION, Detroit, Mich. The representative is located at 808 Hanna Bldg., Cleveland, Ohio.

RONALD D. GUMBERT has been made executive vice-president of the Alloy Precision Castings Co., Cleveland, Ohio.

Pennsylvania

FRANK E. MYERS, vice-president of operations at Salem-Brosius, Inc., Pittsburgh, Pa., will now be in charge of all manufacturing and operating functions of the company. THOMAS E. LLOYD, formerly assistant to the president, will become manager of sales, and CARL J. WESTLING, chief engineer.

BOB DANDO, salesman for the Standard Pressed Steel Co., Jenkintown, Pa., has been transferred from St. Louis, Mo., to Philadelphia, Pa., his territory now being eastern Pennsylvania, except Philadelphia and Lancaster.

JOSEPH P. SOMERS has been appointed assistant to the president of the Wyckoff Steel Co., Pittsburgh, Pa. He was formerly assistant to the vice-president in charge of the company's eastern region in Philadelphia, Pa.

HOWARD J. EVANS and ROBERT J. SARRAF were recently appointed chief engineer and chief chemical engineer, respectively, of the Meter and Valve Division of the Rockwell Mfg. Co., Pittsburgh, Pa.

AMERICAN CLADMETALS CO., Carnegie, Pa., has appointed the JOSEPH KINNEY CO., also of Carnegie, exclusive representative, to handle all sales, sales engineering, and customer service.

WILLIAM O. MURRAY has been appointed industrial sales engineer for the Parker Appliance Co., Cleveland, Ohio, with headquarters in Pittsburgh.

CARL E. JOHNSON, who has served as engineer at the Scaife Co., Oakmont, Pa., for nineteen years, was recently appointed chief engineer.

Obituaries

CHARLES A. BRIZZOLARA, works manager at Danly Machine Specialties, Inc., Chicago, Ill., died suddenly on October 23 at his home in River Forest, Ill., at the age of fifty-nine years. Mr. Brizzolara was born in Chicago and attended schools there. In 1913, he joined the engineering training course at the Western Electric Co., and remained with that company until he joined the Danly concern in 1928. In the late thirties he supervised an expansion program which more than quadrupled the manufacturing potential of the company. During the reconversion period after World War II, he was active in converting production facilities to the manufacture of heavy mechanical presses. At the time of his death, Mr. Brizzolara was engaged in a new expansion program for the manufacture of standard die sets.

JOHN S. DODGE, president and general manager of the Lowell Wrench Co., Worcester, Mass., died suddenly on November 4 at the age of forty-eight years, in Brentwood, N. H. For many years, Mr. Dodge was associated as a sales engineer with the American Screw Co. of Willimantic, Conn. Two and one-half years ago, he succeeded his father as head of the Lowell Wrench Co. Mr. Dodge is survived by his wife, two sons, and two daughters.

JAMES E. LOSHBOUGH, founder and president until his retirement in 1951 of the Federal Press Co., Elkhart, Ind., died on October 10 in Elkhart at the age of eighty-one years. Mr. Loshbough was a well-known designer and manufacturer of presses. In 1914 he founded the L & J Press Co., from which he withdrew in 1925 to establish the Federal Press Co. with his son, Leonard, as partner.

WILLIAM RAY CULBERTSON, a vice-president of the Rust Furnace Co., Pittsburgh, Pa., died on October 29 at his home in Mount Lebanon, Pa., at the age of sixty-two years. Mr. Culbertson joined the company in 1932 as general manager, and in 1945 was elected a vice-president. He was well known in the steel and construction industries. He is survived by his wife and two daughters.

JOHN T. ROBBINS, metallurgist and sales engineer for Peter A. Frasse & Co., New York City, died on October 18 at the age of fifty years. Mr. Robbins was widely known throughout the country as a result of his twenty years of service in the metal-working industry. He is survived by his wife and two children.

RUSSELL S. ROELLER, general sales manager, Pennsylvania Salt Mfg. Co. Philadelphia, Pa., died on November 12 after a brief illness, at the age of sixty years. Mr. Roeller joined the company in 1922 as a salesman and was recently honored by the company for his thirty years of service.

HARRY D. SIEGFRIED, retired manager of sales in the Steel Division of Henry Disston & Sons, Inc., Philadelphia, Pa., died suddenly on October 22 at the age of sixty-three years. Mr. Siegfried was with the company from 1924 until his retirement last April 1.

JOSEPH MINARIK, president of the Abart Gear & Machine Co., Chicago, Ill., died on October 24 at the age of fifty-nine years. Mr. Minarik was widely known in gear manufacturing circles.

HERMAN THALER, factory manager at the Micromatic Hone Corporation, Detroit, Mich., an employe of the company since 1929, died October 13.

* * *

Fast-Acting "Loudspeaker" Clutch

A fast-acting clutch that works on the same moving coil principle as the electrodynamic loudspeaker of an ordinary radio receiver has been developed by the National Bureau of Standards. The new clutch is activated by applying direct current to a coil located in a constant magnetic field. The force resulting from the interaction of the coil current and the magnetic field moves the coil and causes the clutch output disc to be pressed against the rotating input members. In an experimental model, a full output-shaft torque of 10 ounce-inches maximum was attained in less than a third of a millisecond after application of the actuating voltage.

In the experimental model, the magnets and coils rotate with the clutch input shaft. Although a permanent magnet could be used, an electromagnet was chosen; the clutch can thus be easily cleaned of any accumulated magnetic particles when the magnetizing current is shut off. Two pairs of slip rings transmit the magnetizing and actuating currents to the rotating assembly. A thin flexible diaphragm is fastened to the actuating coil. When the voltage is applied, the coil jumps forward and presses the clutch output disc between the rotating diaphragm and the backing disc.

Compensating coils are attached to the pole faces of the electromagnet, close to the actuating coils. All the coils are connected in series so that the current is the same in all windings, but the direction of current flow in the compensating coils is opposite to that in the actuating coils.

Coming Events

DECEMBER 1-6—Twentieth National Exposition of Power and Mechanical Engineering at the Grand Central Palace, New York City, under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Executive assistant secretary, Ernest Hartford, 29 West 39th St., New York 18, N. Y.

JANUARY 19-22, 1953—PLANT MAINTENANCE CONFERENCE AND SHOW at the Public Auditorium, Cleveland, Ohio. For further information, address Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MARCH 23-27, 1953—Eighth Western Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS, to be held in the Pan-Pacific Auditorium, Los Angeles, Calif. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

MARCH 31-APRIL 2, 1953—First International Magnesium Exposition of the MAGNESIUM ASSOCIATION, at the Washington National Guard Armory, Washington, D. C. Further information can be obtained by addressing the Association at 122 E. 42nd St., New York 17, N. Y.

APRIL 27-MAY 8, 1953—BRITISH INDUSTRIES FAIR at Earls Court and Olympia, London, and Castle Bromwich, Birmingham, England. For further information, contact British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

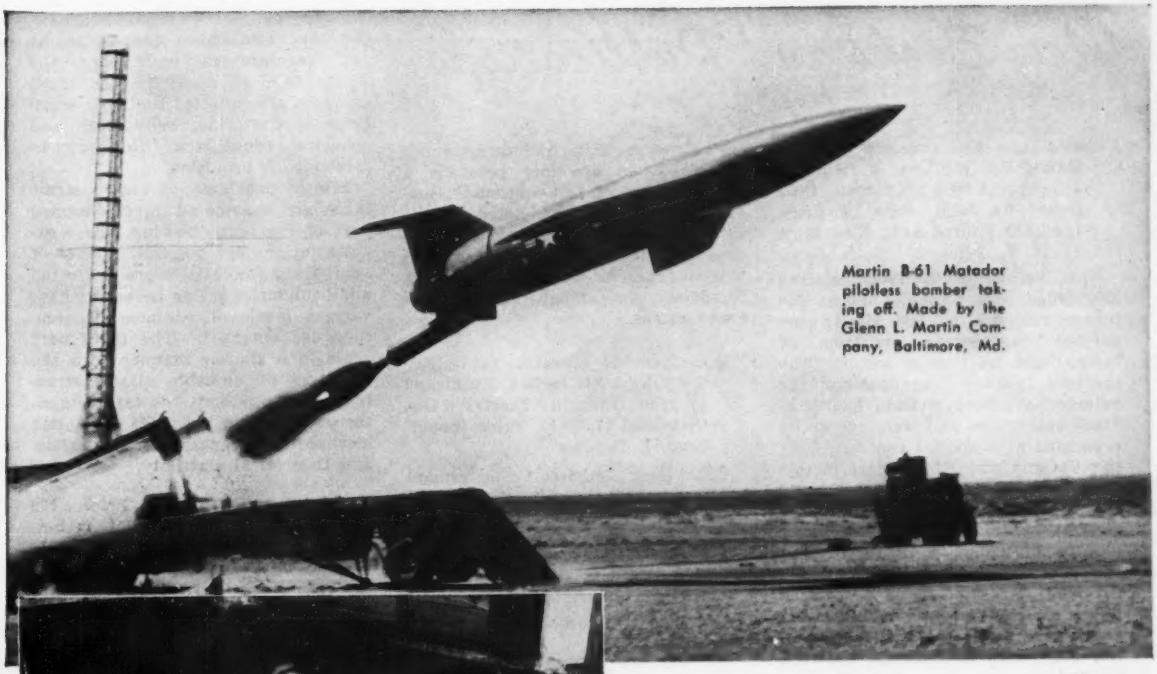
JUNE 16-19, 1953—National Spring Technical Meeting and Welding and Allied Industry Exposition of the AMERICAN WELDING SOCIETY at the Shamrock Hotel, Houston, Tex. Executive secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

* * *

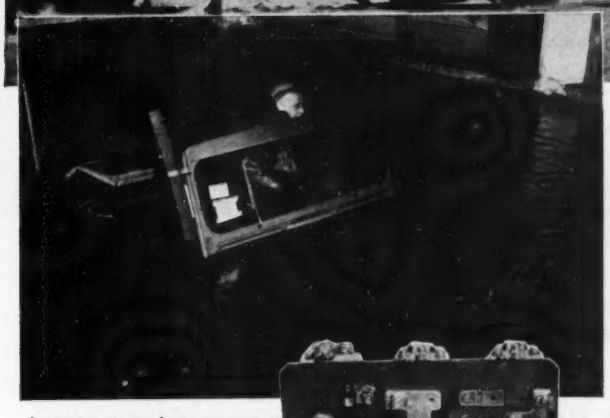
To assist manufacturing concerns in the organization of their standardization work, a private five-day seminar, designed for company representatives, will be held by Dr. John Gaillard, mechanical engineer, of the American Standards Association, on January 26 through 30, at the Engineering Societies' Building in New York. For details, write Dr. Gaillard, 40 W. 118 St., New York 27, N. Y.

* * *

The total value of milling machines shipped during 1951 amounted to $70,300,000, a gain of 93 per cent over 1950. As in 1950, the principal milling machines shipped were the bed and knee types. These machines accounted for 62 per cent of the total value of milling machines shipped during 1951.



Martin B-61 Matador pilotless bomber taking off. Made by the Glenn L. Martin Company, Baltimore, Md.

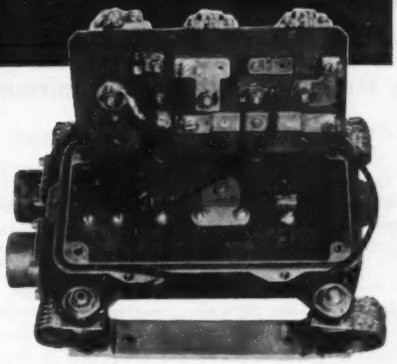


Jeep almost completely submerged. Can be operated in this position at about 9 miles per hour. Made by Willys-Overland Motors, Inc., Toledo, Ohio, for the Armed Forces.

In the Air— On Land— Under Water—

WHERE REQUIREMENTS ARE SEVERE, CALL REVERE

The dramatic pictures on this page show two important special applications of Aerovox capacitors. One is the Martin B-61 Matador pilotless bomber. It contains an Aerovox capacitor, which has to withstand the terrific acceleration and speed of the craft. The other is the submersible Jeep. Its 24-volt electrical system is completely waterproofed, and includes Aerovox filters and capacitors for suppression of radio interference. Revere not only supplied copper and brass strip for the capacitor cases, but collaborated closely in setting up specifications, and in addition worked on a welding problem. In regard to the latter, an Aerovox Project Engineer wrote: "We have had much better welds." . . . Revere is always glad to collaborate on problems concerning copper and its alloys, aluminum alloys, and electric welded steel tube. Call the nearest Revere Sales Office.



Generator regulator for the 24-volt system of the submersible Jeep. This is completely waterproof and highly resistant to corrosion and fungi. Produced by The Electric Auto-Lite Company, Toledo, Ohio.





Illustrated are two of the many types of capacitors and filters made by Aerovox Corporation, New Bedford, Mass.; an important capacitor supplier to both Electric Auto-Lite and Glenn L. Martin. The unit above is the filter capacitor used in the generator regulator of the submersible jeep while the unit at the right is used in the pilotless bomber.

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New Books and Publications

FATIGUE AND FRACTURE OF METALS. Edited by William M. Murray. 313 pages, 6 by 9 1/4 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $6.

This volume coordinates existing knowledge and indicates paths for future research in the vitally important engineering problems of fatigue and fracture of metals. The fourteen papers constituting the volume have been written by recognized authorities and were originally presented at a special conference on the Fatigue and Fracture of Metals held in 1950 at the Massachusetts Institute of Technology. Surveying general experience with failure of metals, the papers go on to consider the internal mechanisms probably involved in fatigue damage, the significance of various metallurgical phenomena to fatigue, and the potential usefulness of different research methods.

The titles and contributors of the papers are: General Survey of the Problem of Fatigue and Fracture, by M. Gensamer; Fatigue Problem in Airplane Structures, by H. L. Dryden, R. V. Rhode, and P. Kuhn; Brittle Fracture and Fatigue in Ships, by F. Jonassen; Brittle Fracture and Fatigue in Machinery, by R. E. Peterson; Internal Stresses and Fatigue, by O. J. Horger and H. R. Neifert; Designing for Fatigue, by R. L. Templin; Fundamentals of Brittle Behavior in Metals, by E. Orowan; Experimental Study on Temper Brittleness of Slightly Alloyed Carbon Steel, by P. A. Jacquet and A. R. Weill; Statistical Aspect of Fatigue Failures and Its Consequences, by W. Weibull; A Review of Cumulative Damage in Fatgue, by N. M. Newmark; Significance of Transition Temperature in Fatigue, by C. W. MacGregor; Influence of Metallographic Structure on Fatigue, by P. L. Teed; Fatigue at Elevated Temperatures, by N. J. Grant; and Techniques of Physical Metallurgy for Studying Fatigue Damage, by J. T. Norton.

ASME MECHANICAL CATALOG AND DIRECTORY (1953). 680 pages, 8 1/2 by 11 1/4 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

The forty-second annual volume of this combined catalogue and directory of industrial equipment and supplies in the mechanical engineering field covers 6500 products made by 4600 manufacturers. There are three sections—a catalogue section contains descriptions of hundreds of items used by industry in manufacturing its products and maintaining its plants; a directory provides a classified list of the equipment, machinery, and supplies listed in the catalogue with the names and addresses of the manufacturers of each product; and a trade name section comprises an alphabetical list of trade names.

WELDABILITY OF METALS. 141 pages, 5 3/4 by 8 3/4 inches. Published by the Lincoln Electric Co., Cleveland 17, Ohio. Price (paperbound), 50 cents.

This book consists of a reprint from the ninth edition of the "Procedure Handbook of Arc Welding Design and Practice," and gives information on how to weld ferrous and non-ferrous metals. The best welding procedure for the various types of carbon and alloy steels is detailed.

ELASTICITY IN ENGINEERING. By Ernest E. Sechler. 419 pages, 6 by 9 1/4 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $8.50.

Directed to the engineer working in structural analysis, the text presents the fundamental theories of stress and deformation of elastic bodies under load. The first part of the text establishes the equations and assumptions underlying the whole field of elasticity. In these chapters are collected the basic equations in Cartesian, cylindrical, and spherical coordinates necessary to solve elastic problems.

Elastic problems of stable structures are considered in the second part of the text, showing where exact solutions are possible. Types of approximate solutions are indicated and boundaries set up between which various levels of engineering accuracy are obtained. The third part deals in a similar manner with the problems of unstable elastic structures. In this way, the text bridges the gap between the fields of applied mechanics, strength of materials, and theoretical elasticity.

DETERGENTS. By Donald Price. 159 pages, 5 1/2 by 8 3/4 inches. Published by the Chemical Publishing Co., Inc., 212 Fifth Ave., New York City. Price, $4.

This book translates the subject of detergents from the realm of specialized organic chemistry into the language of the layman. At the same time, it is a treatise which accurately reveals the chemical nature of the various groups of surface-active agents and the nature of their action in removing water hardness and in wetting hard-to-wet surfaces. The book defines detergents, traces their development, states the role of detergents in home and industry, and gives information on testing and choosing detergents.

Twelve Rules for Buying Aluminum Castings

Prepared by Foundry Members of the Aluminum Association

1. Carefully estimate the number of aluminum castings required and the rate of production so that the most economical casting method can be chosen.

2. Determine the mechanical and physical requirements of the part so that the proper alloy can be selected which will be suited to the method.

3. Request bids from several foundries of good reputation that have the experience and facilities to furnish castings of the type desired.

4. Submit detailed drawings and a model or test pattern when available; if a reorder, submit sample.

5. Specify service conditions in detail, especially any points of high stress, or pressure-tightness, if required. Indicate machining locating points.

6. Ask prospective suppliers if they have control equipment, inspection procedures, and laboratory facilities to assure the attainment of specified physical and mechanical properties consistently.

7. If the casting requires a high-strength alloy, ask prospective suppliers if they have adequate heat-treating equipment with accurate temperature control.

8. If possible, investigate the experience of other customers with prospective suppliers.

9. After a supplier has been tentatively selected, visit him and see for yourself the plant's facilities.

10. Do not give your order to the lowest bidder unless you are satisfied that he will produce good quality castings at the lowest over-all cost. Sometimes manufacturing difficulties will wipe out any apparent savings.

11. After choosing a supplier, provide for the fullest possible consultation and collaboration between your design engineers and his technical personnel.

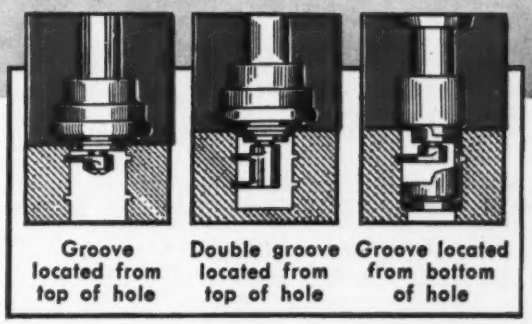
12. Give careful consideration to any changes the foundryman suggests that might simplify production, or reduce costs, or result in better castings.

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for precision cutting of internal grooves in bores and housings

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Ground Now Broken for $5,000,000 Kearney & Trecker Plant

Establishment of a special machinery division for building huge machine tools weighing as much as 250 tons was announced November 6 by Francis J. Trecker, president of the Kearney & Trecker Corporation, Milwaukee, Wis. The newly formed division will have its operations centralized in a modern manufacturing plant to be constructed on a 38-acre site in the environs of Milwaukee. Of single-story design, the plant will have approximately 193,000 square feet under one roof, of which 20,000 square feet will be set aside for offices and storage purposes.

The decision to build the plant was made following months of study by the Munitions Board and various government security planning agencies, which then approved the proposed facilities as a necessity for national defense. In explaining this, Mr. Trecker said, "Following World War II, military missions made intensive studies of the production methods of German manufacturers, and found that the Germans had advanced far beyond Americans in forging large sections for aircraft. Germany used presses having a capacity as high as 50,000 tons, whereas American efforts had been limited to a maximum of 15,000 tons.

"It was recommended to the Joint Chiefs of Staff that American aircraft manufacturers use giant presses for making large plane components. This recommendation resulted in a $400,000,000 order by the Government for huge presses. Presses of such size will produce a corresponding need for new machine tool capacity to machine the dies and the large parts forged by them. The die-blocks may be several hundred cubic feet and weigh upward of 10 tons. The forged parts may be 15 to 20 feet long and one-half as wide.

"It was decided that an established manufacturer of machine tools should increase its existing capacity to produce the highly complicated machine tools necessary for such work."

Mr. Trecker stressed the point that, although the Defense Department would have first call upon the production of the new plant, a great share of the production in the immediate future will be available for non-defense production. A certificate of necessity was issued by the National Production Authority in the amount of $5,232,000, permitting amortization within five years. Under the present construction schedule, the plant should be finished in late June or early July of 1953. Priority allocation of structural steel has been made to facilitate the construction of the new building. More than $2,500,000 worth of machine tools, including some sixty large units, will go into the manufacturing space. Henry H. Lentzner, a thirty-year Kearney & Trecker employe and executive, will be manager of the new Special Machinery Division.



Francis J. Trecker, president of the Kearney & Trecker Corporation, breaks ground for a new, $5,000,000 manufacturing plant. Looking on (left to right) are Harold W. Kippers, sales manager; Morris L. Hutchens chief engineer; and Henry H. Lentzner, manager, all of the Special Machinery Division which will occupy the plant.

Properties of Electrodeposited Nickel

A clearer picture of the effect of plating variables on the structure and properties of electrodeposited nickel has resulted from an investigation sponsored by the American Electroplaters' Society, and conducted over the last five years by the National Bureau of Standards. The conclusions of the study are that hardness, tensile strength, and other properties of nickel deposits can be varied over a wide range by proper choice of the plating bath.

It was found that the most important factor affecting the properties of the deposits is the type of plating solution. Although deposits produced at lower temperatures were usually finer grained than those obtained at high temperatures, the effects of variations in operating conditions are, in general, relatively small.

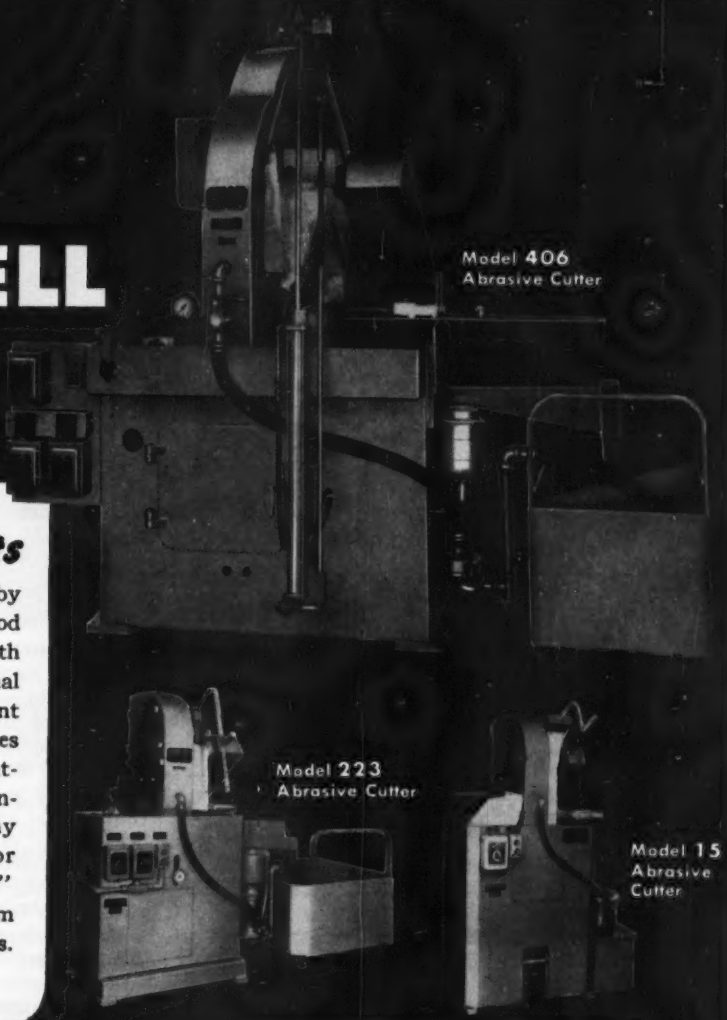
The properties of the deposits were influenced very little by the concentration of nickel in the plating solutions. However, the effect of the chloride content on the hardness of deposit was striking.

In the pH measurements, it was found that when the pH of the bath goes above 5, the tensile strength of the deposit rapidly rises and the ductility decreases. If the pH of the solution is made high enough, there is a marked increase in hardness and tensile strength and a decrease in elongation. However, these extreme properties are accompanied by such a great increase in stress that the deposits are likely to crack spontaneously or flake off.

In general, deposits with coarse-grained structures contained relatively small amounts of impurities and were soft, ductile, and low in tensile strength. On the other hand, deposits with either fine-grained structures or no visible grain structures contained a relatively large amount of impurities and were strong and hard but not very ductile.

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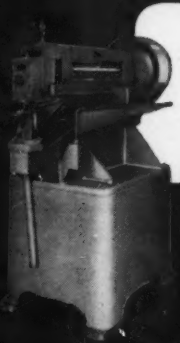


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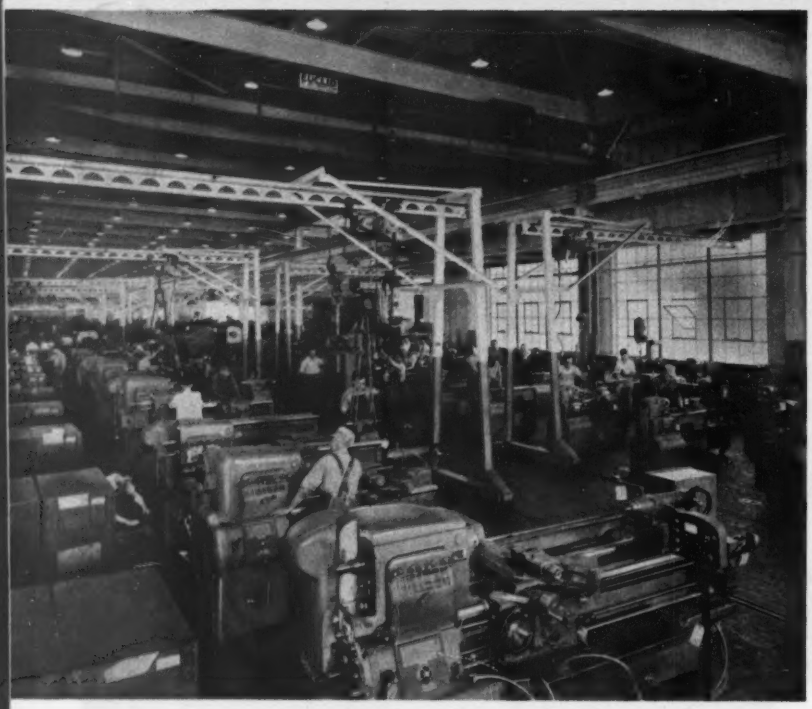
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Cranes are used for many operations besides transporting materials. More than eighty new overhead, gantry, and tramrail cranes have been installed in the Monarch plant.

Monarch Completes Large Expansion and Modernization Program

On a recent Sunday over 12,000 friends and neighbors visiting the Monarch Machine Tool Company, Sidney, Ohio, were given an opportunity to inspect the expanded and modernized facilities of the plant. Since the outbreak of hostilities in Korea, this leading lathe builder has greatly increased floor space, added equipment, and modernized production methods. In addition to its line of engine and tool-room lathes, Monarch is also concentrating production on its new right-angle (T) lathes for making jet-engine rings and discs.

Expanded single-floor production area of the plant now totals 308,000 square feet. The lay-out features a directional flow of materials, a breakdown of lathe construction into a series of self-contained departments, new materials-handling equipment, and modern heating, lighting, and service facilities. Machine tools that had previously been grouped by type and function have been relocated throughout the manufacturing area and augmented by new machines. Lathe production is no longer considered a single manufacturing procedure. Now, many separate departments have been created, each with the responsibility for machining and inspecting a single major component, such as headstocks, tailstocks, carriages, and beds.

Raw materials—castings, forgings, and bar stock—enter the building from the south end, and progress through the various production departments. The individually manufactured major components and the lesser parts and accessories come together in the erection area at the north end of the building, where they are assembled, inspected, and tested as complete machines. Much waste motion has been eliminated.

A quality control center is located within the immediate vicinity of the departments. A building within a building, this center includes a chemistry laboratory, a metallurgical laboratory, a gear control area, facilities for experimental heat-treating, and a dark room. To insure that the flexibility and usefulness of their machines will anticipate, rather than simply parallel or even lag behind the needs of industry, Monarch has maintained an experimental engineering group since 1946. Trained engineers are continually exploring better methods and processes, as well as possible changes in design, materials, and operations.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (TITLE 39, UNITED STATES CODE, SECTION 233),

of MACHINERY, published monthly at New York, N. Y., for October 1, 1952.

1. The names and addresses of the publisher, editors, managing editor, and business managers are: Publisher, The Industrial Press, 148 Lafayette St., New York 13, N. Y.; Editor, Charles O. Herb; Consulting Editor, Franklin D. Jones; Business Managers, Robert B. Luchars, Edgar A. Becker, and Harold L. Gray. The address of all the foregoing is 148 Lafayette St., New York 13, N. Y.

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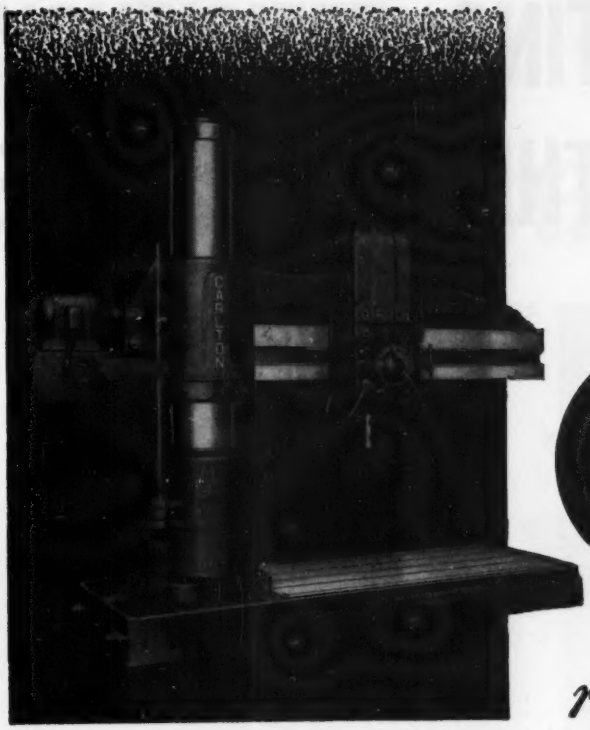
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EDGAR A. BECKER, Business Manager

Sworn to and subscribed before me this 22nd day of September, 1952
(SEAL)

MILDRED D. ALBERE
Notary Public, State of New York, No. 52-0032100
Qualified in Suffolk County
Cert. filed with County Clerks Suffolk, Kings & N. Y.
Certs. filed with City Reg. Kings & N. Y.
Commission Expires March 30, 1953



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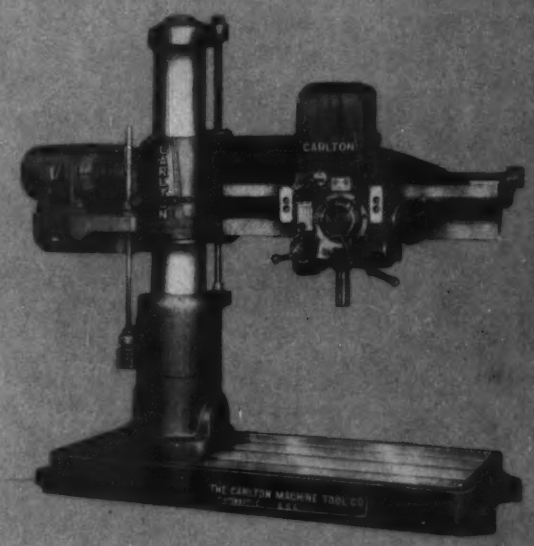
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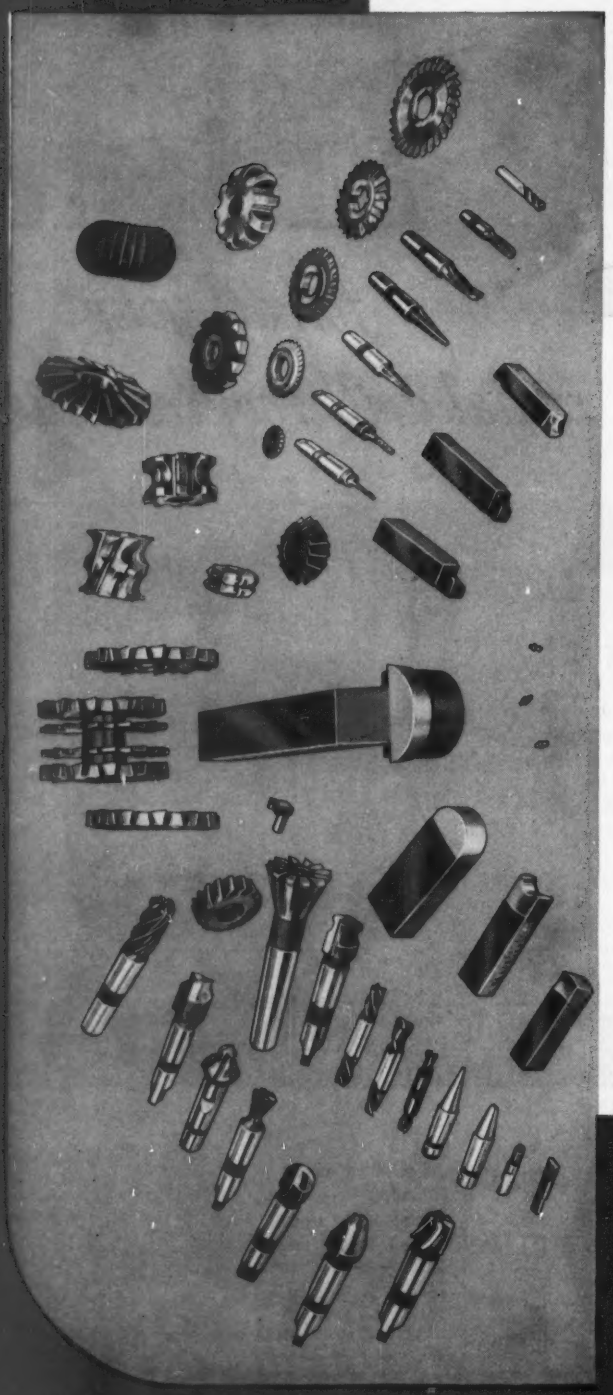
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CITY _____ STATE _____

- ☐ 1A— 9″ col. 3′–4′ arms; 11″ col. 3′–4′–5′ arms
- ☐ 3A— 13″ col. 4′–5′ arms; 15″ col. 4′–5′–6′ arms; 17″ col. 5′–6′–7′ arms
- ☐ 4A— 19″ col. 6′–7′–8′ arms
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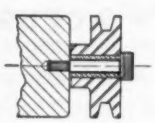
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MACHINE TOOLS • CUTTING TOOLS • GAGES

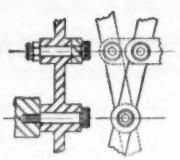


UNBRAKO Shoulder Screw Applications



1. Stationary Shaft or Pivot

A. Idler pulley
B. Idler gear
C. Circular form tool
D. Lever, crank or linkage arm
E. Cam
F. Latch



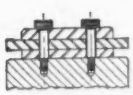
2. Moving Shaft or Pivot

A. Linkage bar connection
B. Cam
C. Cam follower
D. Ratchet
E. Planetary gear or pinion

UNBRAKO SHOULDER SCREWS...
uniform, standardized, precision threaded
industrial fasteners...HAVE NUMEROUS APPLICATIONS

You can use these UNBRAKO Socket Head Shoulder Screws as stationary shafts or pivots, moving shafts or pivots, stationary guides, and for stripper plate and pressure pad applications. These UNBRAKO screws have shoulders held to close tolerances, finished threads close to the shoulder, and threads and heads concentric with the body. Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 19, Pennsylvania.

UNBRAKO SOCKET SCREW DIVISION



3. Stationary Guide

A. Locating pin in jigs and fixtures
B. Latch stop
C. Alignment of stationary members
D. Linkage block
E. Grooved cam
F. Adjusting block



4. Stripper Plate Uses

A. Blanking dies
B. Compound dies
C. Progressive compound dies
D. Drawing dies
E. Redrawing dies
F. Piercing and shearing dies
G. Combination blanking, drawing and piercing dies
H. Double action blanking and drawing dies



5. Pressure Pad Uses

A. Cutting-off dies
B. Bending dies
C. Bending and forming dies
D. Assembly dies
E. Double action blanking and drawing dies

SPS
JENKINTOWN PENNSYLVANIA





Tapping problem solved; production boosted 25%

● A midwest manufacturer was having trouble with a thread tapping operation. Performed on the drill press shown above, the job called for the tapping of a ¾-inch threaded hole in nuts made from C-1018 steel stock. The quality of threads tapped was poor. Rejections ran high because of torn threads.

Consulted on this problem, a Standard Oil lubrication specialist recommended the use of STANICUT Cutting Oil 309 BCS. Replacing a conventional cutting fluid, STANICUT turned the tide on troubles. With its use, quality of threads has been excellent. Rejections have been reduced to a minimum. Production has been boosted 25% — an increase of approximately 100 pieces per hour!

Whatever your cutting oil problem, the Standard Oil lubrication specialist in your section of the Midwest can help you solve it. Backed by one of the most complete lines of cutting oils on the market, he has the training and experience to apply those products most effectively. You can contact him by phoning your local Standard Oil (Indiana) office. Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

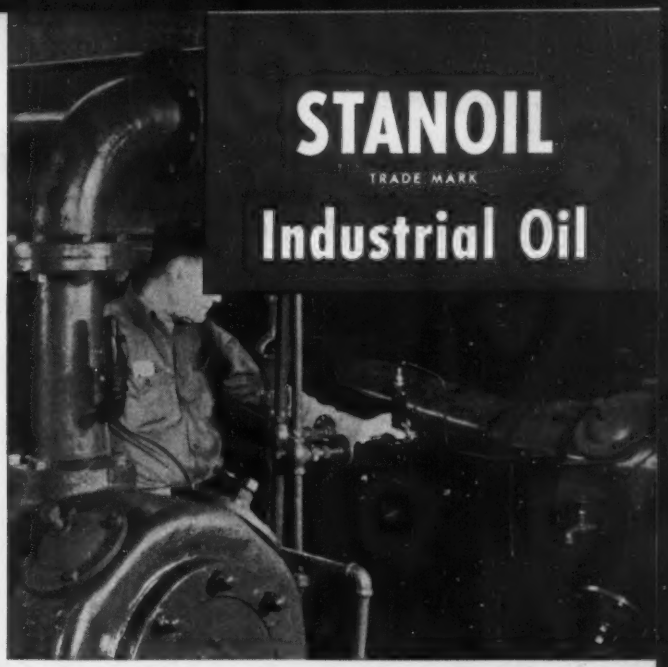
What's YOUR problem?



D. F. Wallace of the Standard Oil office in Saginaw, Michigan, is the lubrication specialist who helped this midwest manufacturer solve a serious problem through the use of STANICUT Cutting Oil.

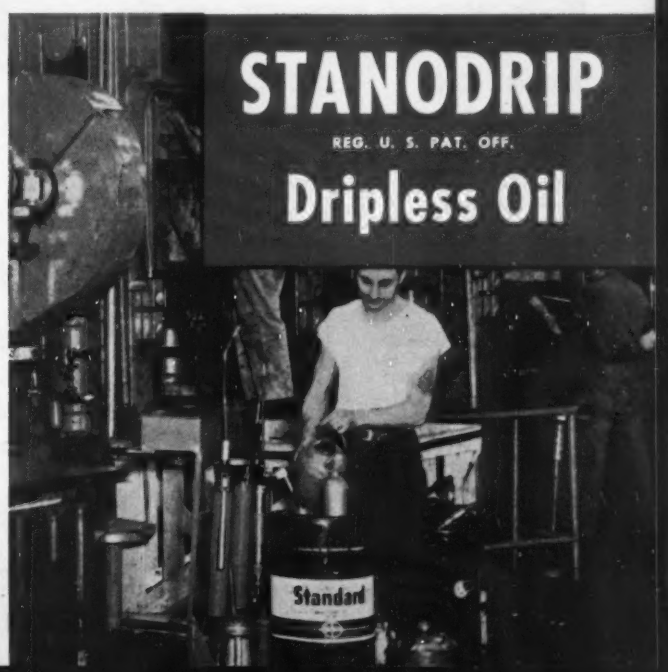
Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools. And like all lubrication specialists, his on-the-job help is always available. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest.

For help with your problem, call for the services of your Standard Oil lubrication specialist today! A call to your local Standard Oil office is all that's necessary.



Compressors give carbon the air. Hayes Industries, Jackson, Michigan, had air compressor trouble caused by formation of carbon on valves. With the change to STANOIL Industrial Oil, compressors gave the air to carbon troubles and have breezed through four years of hard operation without difficulty. Over the oil previously used, STANOIL has given four times longer service in crankcases.

No drips in this press room. STANODRIP Dripless Oil solved a press room lubrication problem at A. O. Smith Corporation Kankakee Works. It put a stop to drippage of oil from bearings on stamping and punch presses. Results: cleaner and safer working conditions, less lubricant consumption, fewer applications of lubricant.



STANDARD

STANDARD OIL COMPANY
(INDIANA)

PRATT & WHITNEY "KELLERING"

Key to PRECISION MOLDS and DIES FOR BETTER PRODUCTS



Unequalled for SPEED, ACCURACY, ECONOMY



PHOTO COURTESY OF INTERNATIONAL MOLDED PLASTICS INC., CLEVELAND.

Pratt & Whitney-KELLER Machines are tracer-controlled millers that faithfully duplicate the shape of any master form or pattern. Very complicated shapes are duplicated as easily and accurately as simple work. Molds and dies of every type can be machined much faster than by any other method, and very little hand finishing is required.

The complete P&W-KELLER line includes models to accommodate a very wide range of work sizes. The Type BL — shown above machining the mold for the platter in this quality plastic dinnerware set — is a versatile machine specifically designed to handle a wide variety of small and medium sized jobs economically and efficiently.

Learn how a Pratt & Whitney-KELLER Machine can lower your die and mold costs and increase your profits. Send today for your copy of P&W Circular No. 490-2. Write on your Company letterhead to the Pratt & Whitney Branch Office nearest you or direct to West Hartford.

PRATT & WHITNEY PRODUCTS FOR THE MOLD AND DIE INDUSTRIES

MACHINE TOOLS

- Jig Borers
- Vertical Shapers
- Toolroom Lathes and Accessories
- Keller (Tracer-controlled) Machines
- Kellerflex Flexible Shaft Machines and Accessories
- Kellerflex H. S. Steel and Carbide Burs
- Automatic Duplicating Machines for Forging Dies
- Automatic Duplicating Machines for Bottle Molds
- Cutter and Radius Grinders
- Diaform Wheel Forming Attachments

CUTTING TOOLS

- Taps and Dies (all types)
- Milling Cutters (all types)
- Reamers (all types)
- Drills and Counterbores

GAGES

- Precision Gage Blocks (Steel and Carbide)
- Supermicrometers
- Electrolimit Comparators
- Electrolimit Height Gages

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.



First Choice P&W *for Accuracy*

Branch Offices . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Bluhm Co.) • DETROIT • HOUSTON (The Bluhm Co.)
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MACHINE TOOLS • CUTTING TOOLS • GAGES



Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

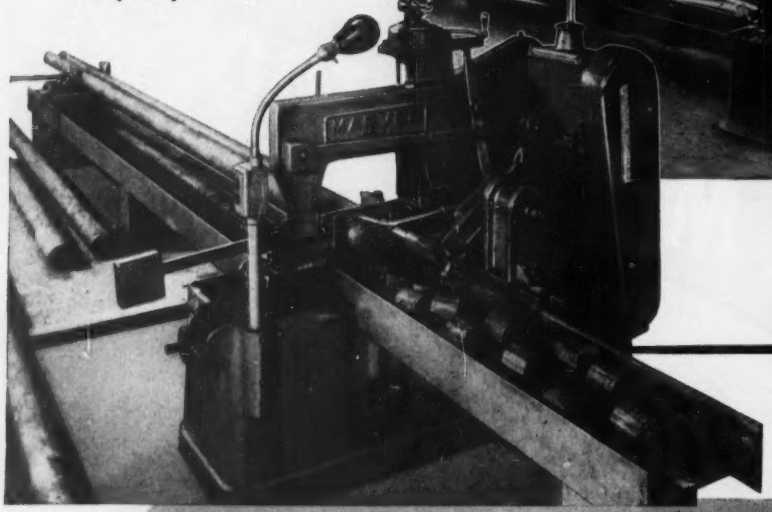
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

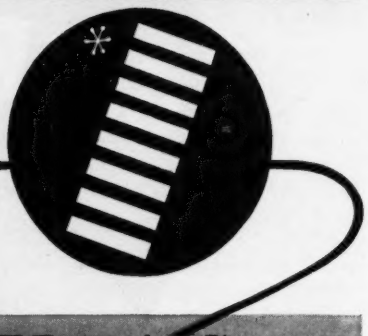
Industrial Gears and Speed Reducers
LimiTorque Valve Controls



No. 9A MARVEL
Production Saws
Capacity 10" x 10"

No. 6A MARVEL
Production Saws
Capacity 6" x 6"





Eight of these MARVEL 9A Saws have already earned *Service Stripes**

Eight of these high speed MARVEL Production Sawing Machines at the Accuracy Steel Cutting Company, Hazel Park, Michigan, (a suburb of Detroit) operated almost continuously thruout the last war—cut up thousands of 20 ft. bars into accurate slices, pieces and lengths, for war production.

Now with a battery of fifteen of these world's fastest hack saws, Accuracy Steel Cutting Company has immense capacity to put behind defense and civilian work.

MARVEL Production Saws will automatically cut bar stock to size at terrific speed . . . they will feed, measure and accurately cut-off identical pieces from single or nested bars *automatically*, with no more operator attention than a battery of automatic screw machines.

Versatile, as well as accurate and fast, these saws can be stopped at any point in a production run—a miscellaneous cut made —and production resumed by simply re-engaging the automatic bar push up.

Write for Catalog

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue — *"The Hack Saw People"* — Chicago 39, U. S. A.

Only Lucas CAN MAKE A LUCAS

but others are lending a hand

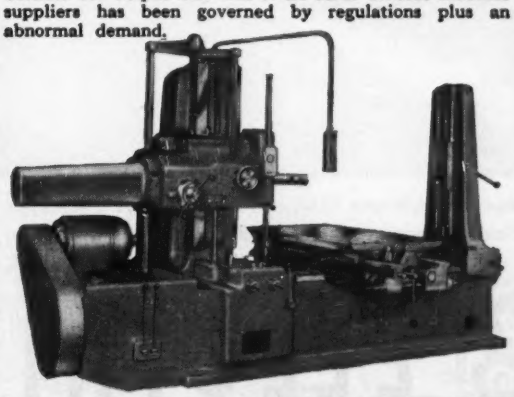
This is one of America's outstanding plants of its kind, and every tool in it is there for the production of Lucas Horizontal Boring, Drilling and Milling machines. This specialization means a greater output of critically needed machines for the defense program.



Thousands of man hours of exclusive experience on Lucas mills enable us to keep quality abreast of quantity.

Many an outside supplier is working 'round the clock on component parts to supplement our own efforts. Final assembly and inspection is still carried on in our own plant.

We still have to keep many a loyal customer waiting, because our output like that of all other defense machine suppliers has been governed by regulations plus an abnormal demand.



Your inquiry and your order are still as welcome as ever. When you do get the Lucas you need you'll find it your No. 1 money maker — the most used machine in the shop.

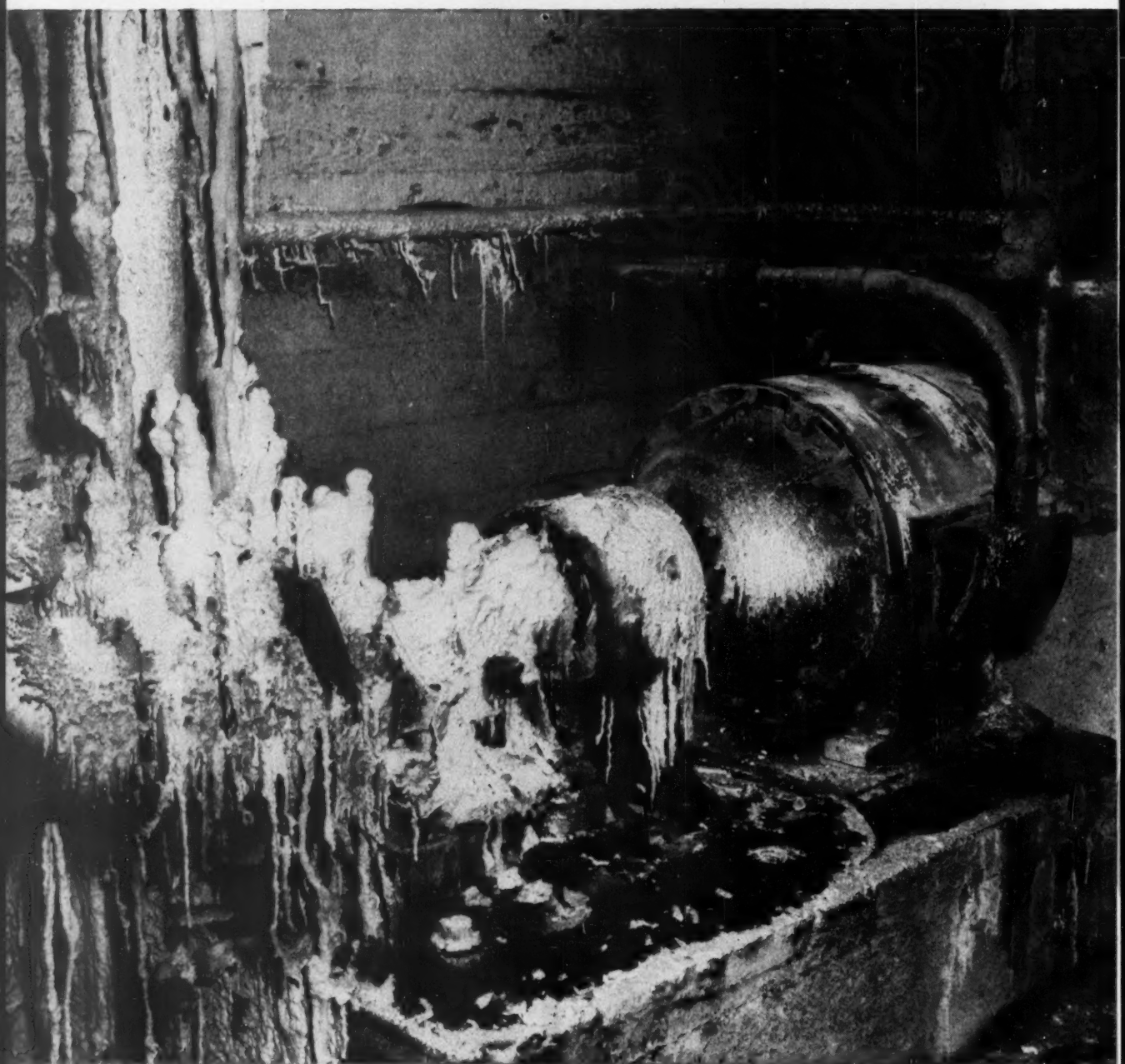
THE NEW BRITAIN MACHINE COMPANY — LUCAS

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

WHEN JOBS ARE TOUGH



CORROSIVE ATMOSPHERE doesn't bother this standard, "off-the-shelf" Tri-Clad motor. Totally enclosed, fan cooled, it runs 12 hours a day, six days a week, driving a flash cooler pump under tough conditions in a chemical plant.

GENERAL ELECTRIC

INDUSTRY DEPENDS ON G-E TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Here are three typical tough jobs being done safely, economically, and without interruption, by G-E Tri-Clad motors. They help show why more than 10,000,000 horsepower of G-E Tri-Clad motors are serving American industry today.

WIDEST VARIETY

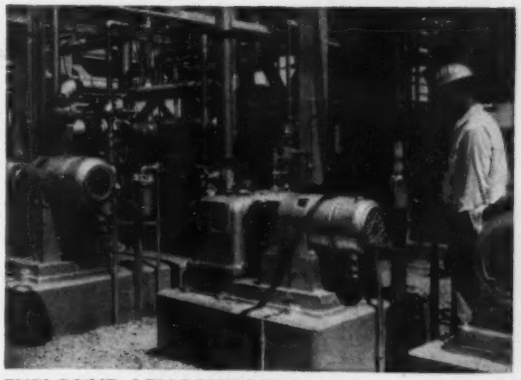
With the widest selection of standard motors obtainable anywhere, the Tri-Clad motor line offers ratings up to 2000 hp; all types of enclosures; gear motors, brake motors, and adjustable-speed drives—plus many other mechanical and electrical modifications to meet your requirements.

TRIPLE PROTECTION

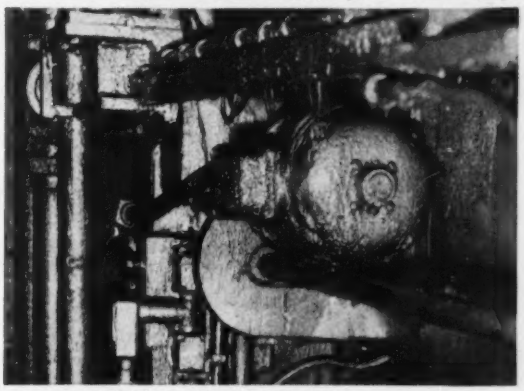
You get triple protection with *every* Tri-Clad motor—against physical damage, electrical breakdown, and operating wear and tear. Completely enclosed bearings last longer because they can be relubricated if necessary—and *without shutdown!* For specific product information, use the coupon below, or contact your nearby G-E Apparatus Sales Office, authorized G-E Agent or Distributor.

IMMEDIATE DELIVERY

Most standard G-E Tri-Clad motors are available immediately from stock. And the most complete sales and service network in the motor industry assures you prompt service by trained specialist and application engineers, for all your motor problems. General Electric Co., Schenectady 5, New York. 752-16



EXPLOSIVE ATMOSPHERE dangers are avoided by using standard explosion-proof Tri-Clad motors, such as these gear-motors driving water and hydrocarbon pumps in an oil refinery.



OIL, MOISTURE, ABRASIVE DUST can't stop this totally-enclosed Tri-Clad motor, operating below the strip in a cold strip steel mill. Motor is completely protected inside and out.

PROGRESSIVE MECHANIZATION...

a new G-E MORE POWER TO AMERICA program—motion picture and manual—case histories of the latest mechanization trends.



Send for literature.

Section F 752-16
General Electric Co., Schenectady 5, N. Y.

Please send me the following on Progressive Mechanization:

☐ Free copy of the Progressive Mechanization Manual (GEA-5789)

Please send the following product bulletins:

☐ GEA-3580 (Open Dripproof Motors)

☐ GEA-4400 (Totally Enclosed Motors)

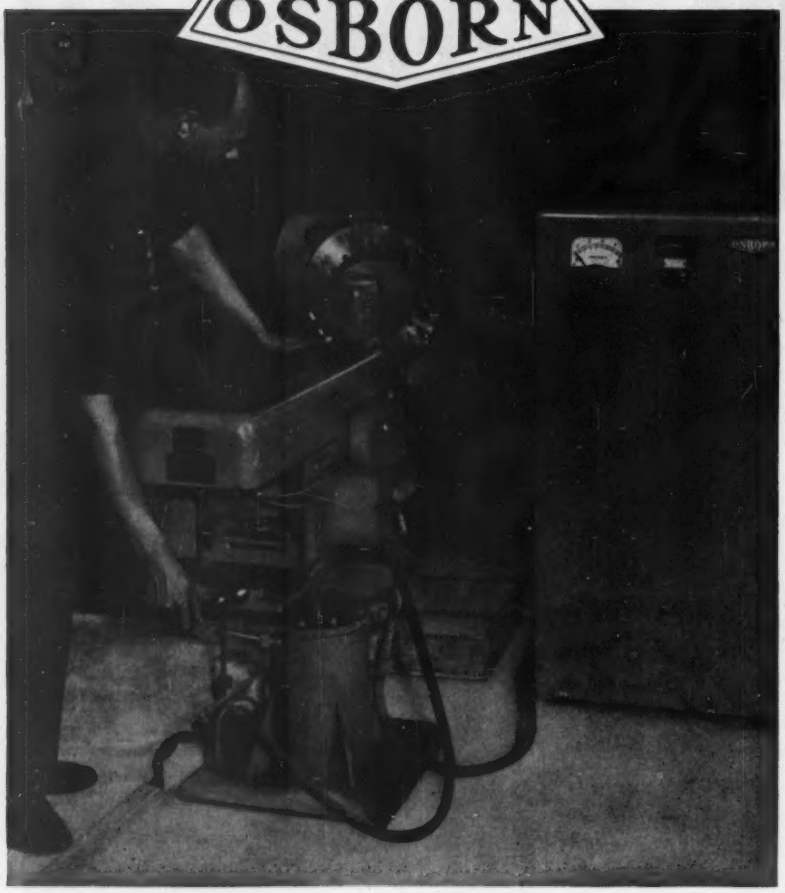
Name.....

Firm.....

Address.....

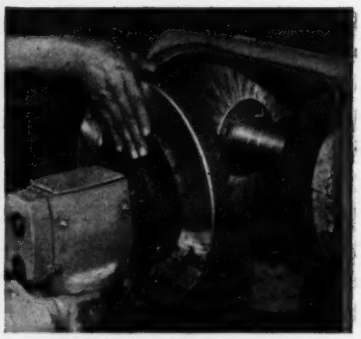
City.....Zone.....State.....

OSBORN





SET-UP IS SIMPLE. The machine is versatile. If your production involves small runs of many different types and sizes of gears and similar parts, you can specify machine settings for each part and operator can make set-up changes easily and quickly for maximum daily output. The complete brushing cycle is controlled automatically by the electronic timer which is set for any desired brushing interval to suit the size, shape or condition of part being brushed.



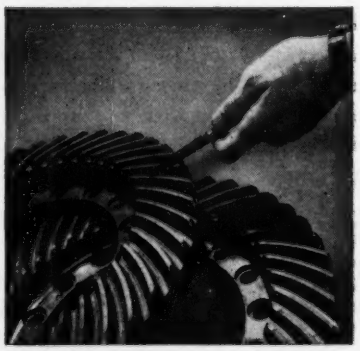
OPERATION IS SPEEDY. The operator mounts the gear easily and quickly. The gear advances to the face of two rotating Osborn brushes and the edge of the gear teeth makes contact with the brushes. To assure fast, positive action on each piece brushed, an automatic control reverses the direction of brush rotation on every cycle of operation.

Deburrs gears 15 times faster at the push of a button!

Want to break a big bottleneck in the production of gears and similar parts? Manufacturers are doing just that with the Osborn Work Holder Brushing Lathe.

In the plant of the White Motor Company, Truck Division, Cleveland, Ohio, this Osborn machine deburrs and finishes gear teeth 1570% faster than the old method. This was done formerly with a portable grinder . . . a tedious operation that took 25 minutes for the 14-inch hypoid gears shown. Now, an operator simply places the gear in the Osborn Work Holder Brushing Lathe, pushes a button and the machine does the job automatically. Floor-to-floor time is only 1½ minutes! Uniformity of finish results in additional time savings in matching and assembly of gears.

It will pay you to investigate this high-speed, high-quality machine for deburring and finishing gears on a production basis. Call your **O**sborn **B**rushing **A**nalyst today or write *The Osborn Manufacturing Company, Dept. 887, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



RESULTS ARE UNIFORM. Burrs and sharp edges are removed uniformly. Every gear tooth has smooth, uniform rounded edges. Surfaces are blended.

INVESTIGATE IT TODAY

for *your* problems. Users report time savings ranging from 20% to 1570% with the Osborn Work Holder Brushing Lathe. Let us demonstrate what it can do for you!

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

Practical Assistance



Whether it's getting out of a fishing tackle tangle, or unsnarling a *cutting oil snag* on your production line . . . practical assistance, the kind that gets you off the hook fast, is the thing you look for most.

And ***PRACTICAL TECHNICAL ASSISTANCE*** is a Cities Service specialty.

Cities Service Lubrication Engineers can offer every machining operation practical assistance that will mean dollars, man-hours and equipment saved. These specialists recommend the most effective lubricating practices, and they offer the most complete line of quality cutting fluids.

but check for yourself:

✔ Check the high quality of Cities Service cutting fluids. Check operations similar to yours, or better still, test them on the job.

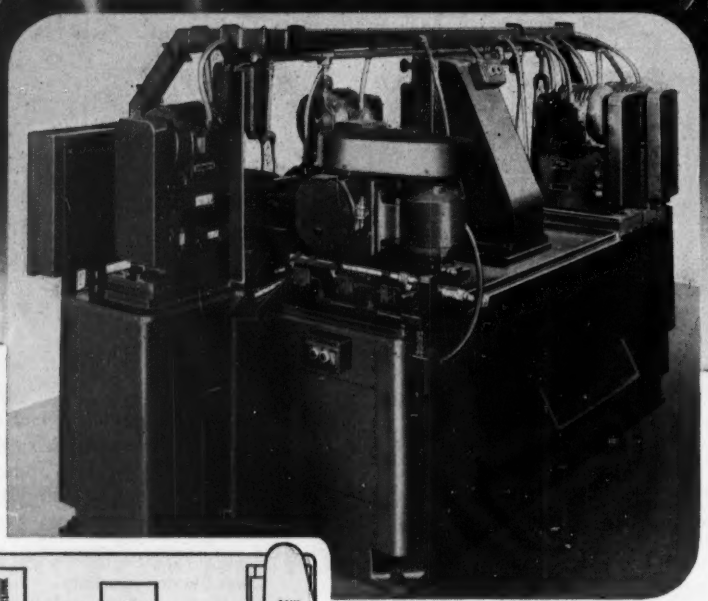
✔ Check the *complete* Cities Service line as an ideal, single source for the correct cutting fluid for every need. Deliveries are quick, accurate and dependable.

✔ And finally, discuss your problems with a Cities Service Lubrication Engineer . . . he's probably solved many like them in manufacturing plants throughout the country. He wants to help you. He can help you. Write or phone CITIES SERVICE OIL COMPANY, Dept. L18, Sixty Wall Tower, New York City 5 . . . or get in touch with the office nearest you.

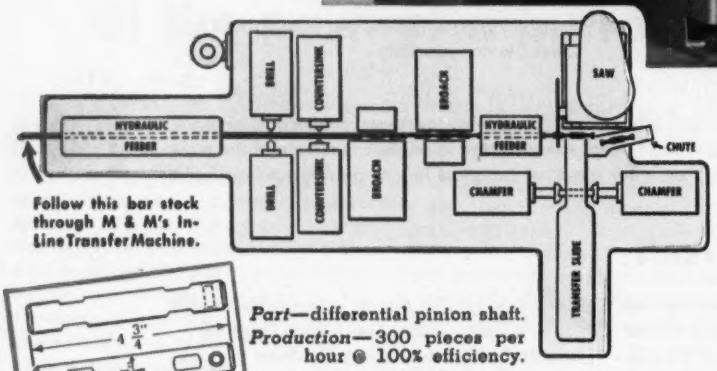
CITIES SERVICE

MPISF

Most Production per Square Foot



Typical M & M progressive IN-LINE automatic transfer machine.



Follow this bar stock through M & M's In-Line Transfer Machine.

Part—differential pinion shaft.
Production—300 pieces per hour @ 100% efficiency.

Motch & Merryweather's forward-looking design *unitizes* a number of operations in the same machine. You obtain maximum usable production per square foot of floor space. Furthermore, you effect the greatest possible savings in time, overhead and operating costs.

Manufactured by —THE MOTCH & MERRYWEATHER MACHINERY CO.—
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY • MACHINES AND EQUIPMENT

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS

See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Magnesium

Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES

See Presses, Arbor.

ARBORS AND MANDRELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Burrell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Cleveland Twist Drill Co, 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BABBITT

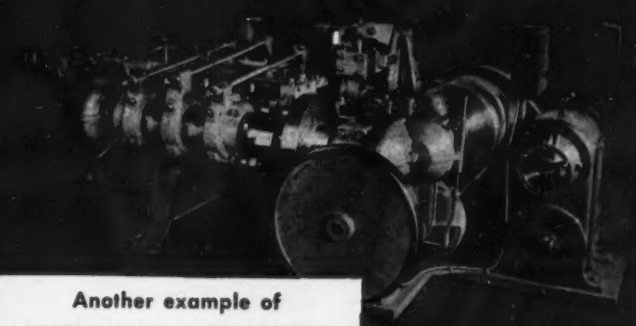
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill,
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.

(Continued on page 280)

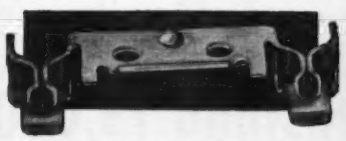
PRODUCTION RECORDS *Broken*
with* NILSON 4-SLIDE *Machine!



Another example of
FASTER, LOWER COST FORMING
of Ribbon Metal Stock

★ *180 Terminal Contacts* **Per Minute**

★ *7 Separate Operations* **Eliminated**



A famous national manufacturer tripled production of the Terminal Contact illustrated above (in actual size) and reduced production costs proportionately by replacing several progress die set-ups with one Nilson 5-3-F four side machine. *Seven separate operations were eliminated;* 180 completed contacts produced per minute. Time required for tooling changes was reduced 50% over similar type machines.

This example clearly shows the big savings you can make in overhead, maintenance, labor and time with a Nilson 4-slide!

Taking stock directly from the coil, **NILSON** metal ribbon stock four-slide machines automatically feed, straighten, pierce, blank, swage, stamp, coin, cut off and perform up to five forming operations with speed and accuracy. Built in five models with capacities up to 2½" wide and feed lengths up to 15". For specific recommendations on your wire and ribbon metal forming problems, send details, prints or samples of your operation to us when you request the bulletin.

There's NILSON *Strength Like A*

Specialists in Wire Forming Equipment for Over 50 Years

THE A. H. NILSON MACHINE COMPANY

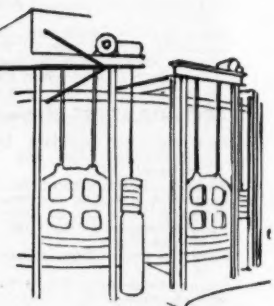
1512-B RAILROAD AVENUE, BRIDGEPORT 5, CONNECTICUT

OTHER NILSON PRODUCTS:

- Automatic chain-making machines
- Automatic staple forming machines
- Wire and Stock reels
- Foot Presses
- Wire straightening equipment
- Slide Feeds for Presses

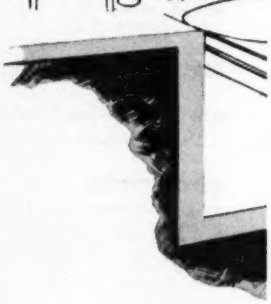


High as a six story building...



An example of the problems that Baldwin engineers solve is the design of this 11,000-ton split die forging press for Cameron Iron Works, Inc. The power to forge parts weighing up to 2,000-pounds had to be designed into certain physical limits and distributed in the frame of the press.

this BALDWIN PRESS will



This is the largest of its type ever built and is at the same time one of the most versatile. It is possible to clamp split dies either horizontally or vertically and pierce either horizontally or vertically at the same time. The force of the rams is adjustable by simple controls, thus limiting the size of dies to that required for any particular load.

produce intricate forgings

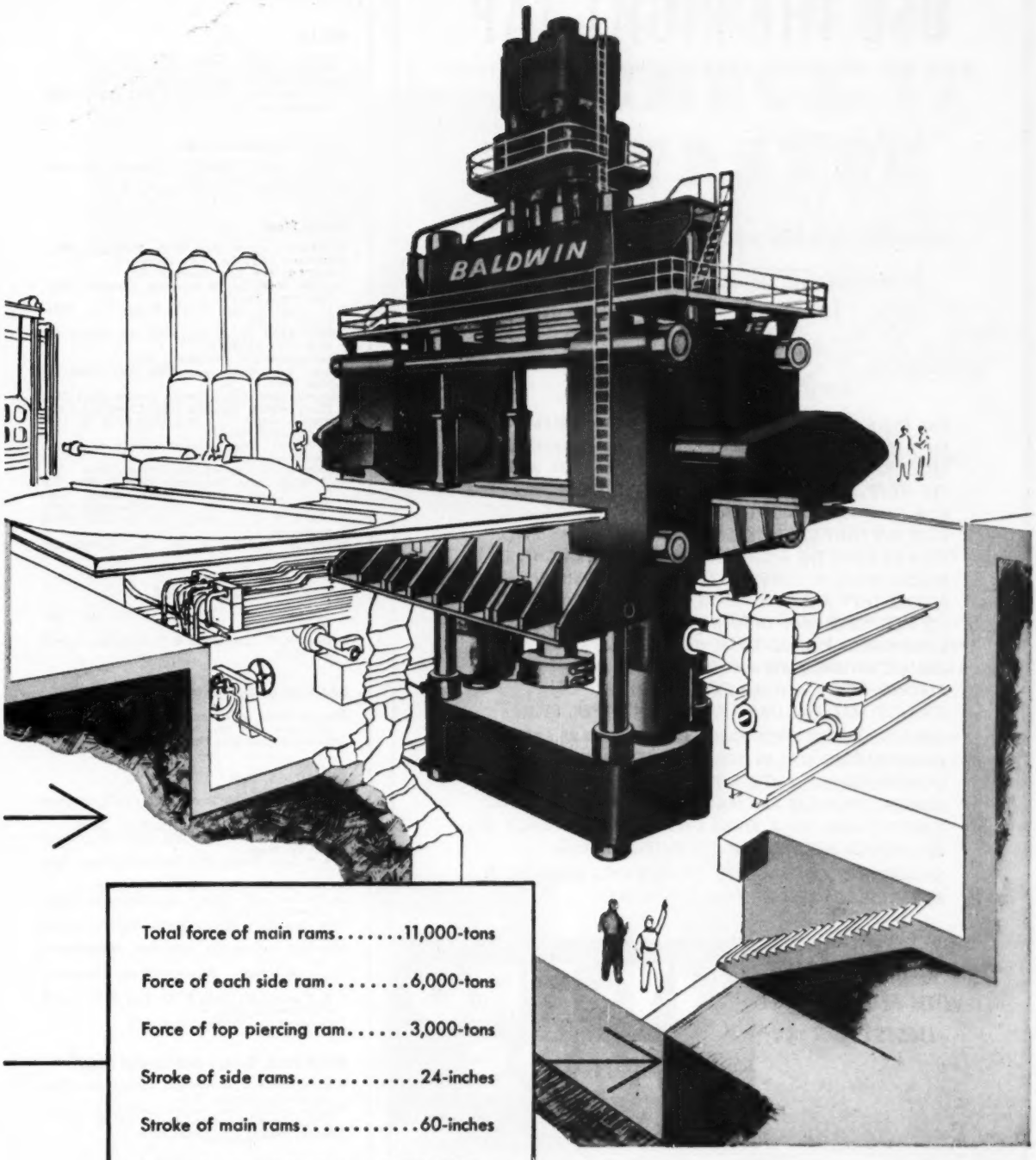
Dies are mounted on 10 x 10-foot bolsters in the vertical press opening which is 12-feet maximum and 7-feet minimum. The horizontal press opening between ram faces is 15½-feet. A piercing ram is superimposed on the moving top platen and a knockout ram mounted in the bed.

to withstand 15,000 psi.

No matter what size press you need, you'll find Baldwin engineers can bring extra experience to bear on your problems. With the result that Baldwin press designs will give you better control and better products—that there will be a built-in smoothness and ruggedness that will lower maintenance costs.

BALDWIN BLH LIMA-HAMILTON

BALDWIN



Total force of main rams.....11,000-tons

Force of each side ram.....6,000-tons

Force of top piercing ram.....3,000-tons

Stroke of side rams.....24-inches

Stroke of main rams.....60-inches

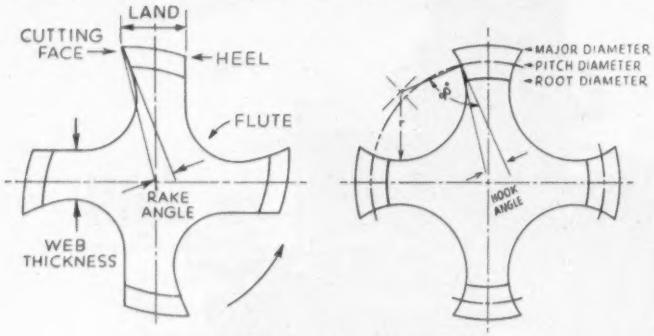
Approximate weight of press, 3,100,000-lbs.

-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

USE THE RIGHT TAP

(HOW TO DO MORE TAPPING WITH FEWER TAPS)



IMPORTANCE OF FLUTE FORM

THE FLUTE IS ONE OF THE MOST IMPORTANT ELEMENTS OF A TAP BECAUSE EACH THREAD IN THE CHAMFERED SECTION FORMS A CUTTING EDGE WHERE IT MEETS THE FLUTE. ALSO, THE FLUTE IS USUALLY THE ONLY SPACE FOR CHIP REMOVAL. IT IS OF PRIMARY IMPORTANCE THAT THE FLUTE SURFACE BE HIGHLY POLISHED AND THAT ITS SIDE HAVE THE RIGHT RAKE ANGLE IF STRAIGHT, OR HOOK ANGLE IF CURVED. TAPS SHOULD BE SHARPENED BEFORE THEY ARE DULL. GREAT CARE SHOULD BE TAKEN TO NOT OVERHEAT THEM IN GRINDING. THE GENERAL SHARPENING RULE IS: LITTLE OR NO HOOK FOR CAST IRON, CAST BRASS OR OTHER CRUMBLY MATERIALS BUT STRONG HOOK ANGLES OF 15° TO 20° FOR TOUGH STRINGY MATERIAL LIKE ALUMINUM, COPPER, ETC.

TAPS CHAMFERED FREE-HAND ARE SURE TO BE UNEVEN OR ECCENTRIC AND IN USE THE CUTTING LOAD WILL BE CONCENTRATED. SUCH TAPS WILL BREAK IF SMALL. A LARGER, STRONGER TAP MAY NOT BREAK BUT WILL DULL QUICKLY AND IN A RIGID CHUCK WILL PRODUCE A BELL-MOUTH HOLE OR AN ECCENTRIC THREAD.

SHARPENING ON A GOOD CHAMFERING MACHINE IS ESSENTIAL FOR REAL TAPPING ECONOMY.

THREAD MORE HOLES WITH FEWER TAPS INSIST ON...

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HY-PRO TOOL COMPANY

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Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.

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Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

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Johnson Bronze Co., New Castle, Pa.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
LaSalle Steel Co., Hammond, Ind.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

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Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

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Johnson Bronze Co., New Castle, Pa.

BEARINGS, Ball

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Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp, Stamford, Conn.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

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Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.

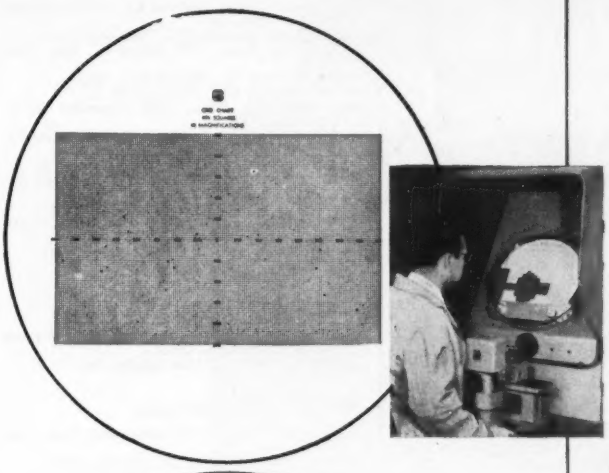
BEARINGS, Lineshaft

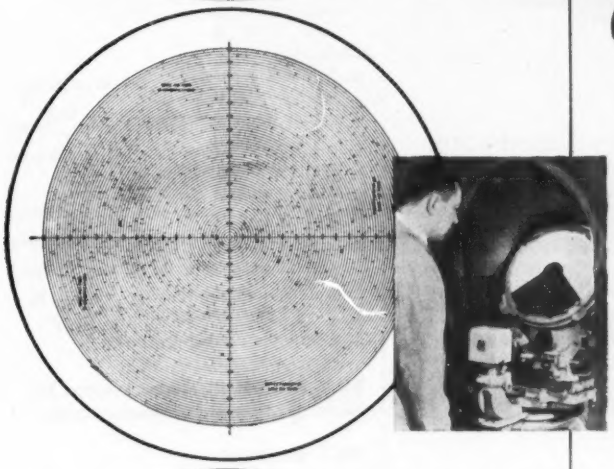
Fafnir Bearing Co., New Britain, Conn.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

(Continued on page 282)







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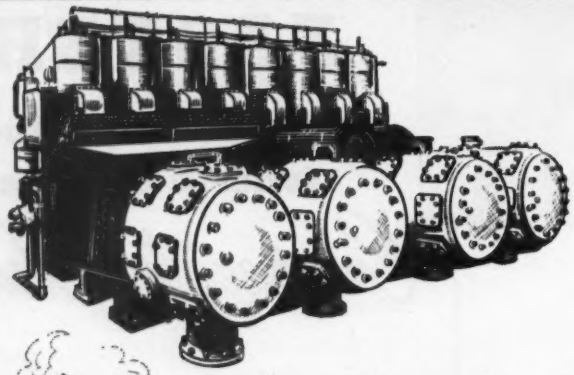
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Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

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Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

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Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Corp., Downers Grove, Ill.
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Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Machinery Div., Titusville, Pa.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
Hannifin Corp, 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.

(Continued on page 284)



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MEET A TYPICAL ORBAN SERVICE ENGINEER AT WORK right in a customer's plant, setting up a Gildemeister Turret Lathe at Special Screw Products, Inc., Bedford, Ohio, and instructing operators in its use. Or it might be a Lindner Jig Borer at Ford—a Cawi Grinder at Thompson Products—a Klopp Shaper at Textile Machine Works.

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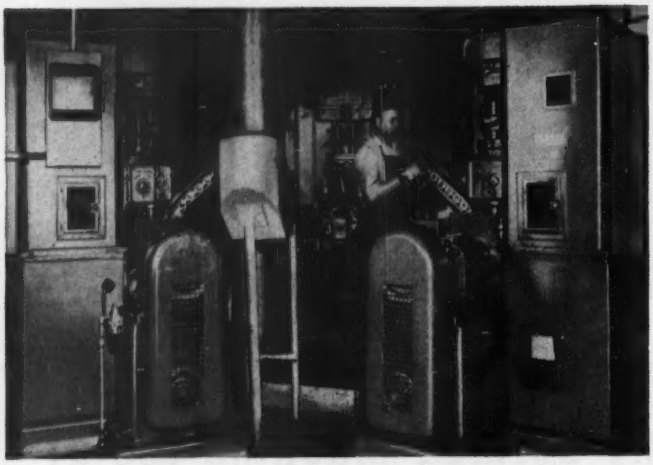
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CLEVELAND tapping machines *lead screw*

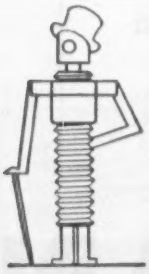
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15 CLEVELAND TAPPERS



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Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

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Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
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New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

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Bethlehem Steel Co., Bethlehem, Pa.
Erie Bolt & Nut Co., Erie, Pa.
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Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
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(Continued on page 288)

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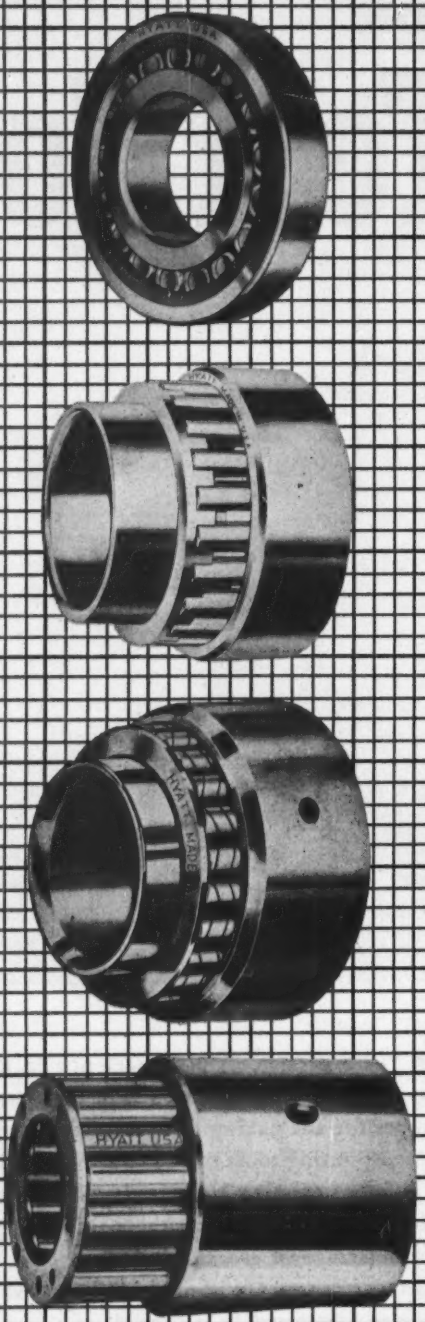


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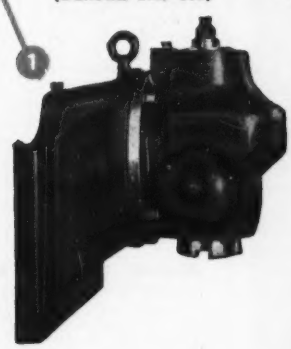
HYATT ROLLER BEARINGS

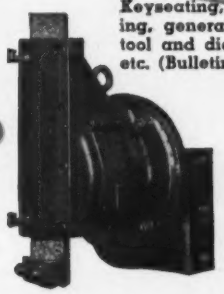
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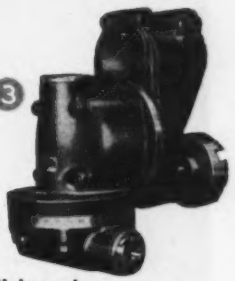


Vertical Head
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 105)





Slotter
Keyseating, broaching, general slotting, tool and die making, etc. (Bulletin No. 107)



Hi-Speed Universal
High speed angular milling in all planes. (Bulletin No. 113)



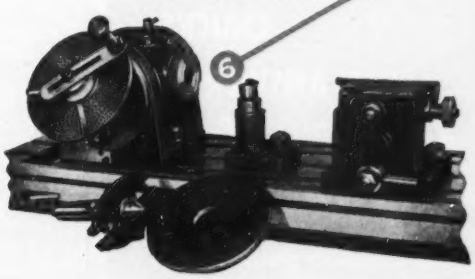
Arbors and Accessories
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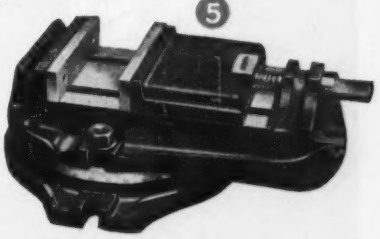


Circular Table
Milling circles or cams, gear cutting, high-speed continuous milling, etc. (Bulletin No. 106)



Dividing Head
Precision indexing. Spiral cutting mechanism and chuck also available. (Bulletin No. 119)





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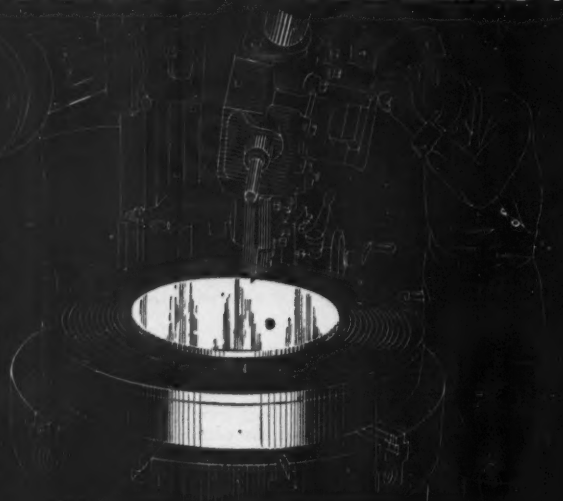
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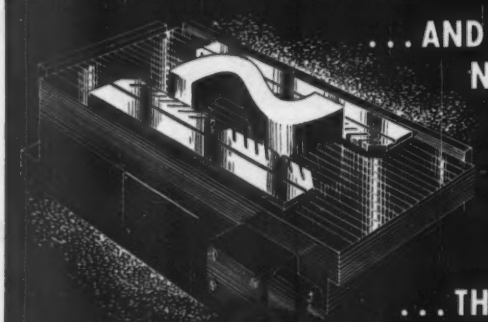
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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Madison Mfg. Co., Muskegon Heights, Mich.
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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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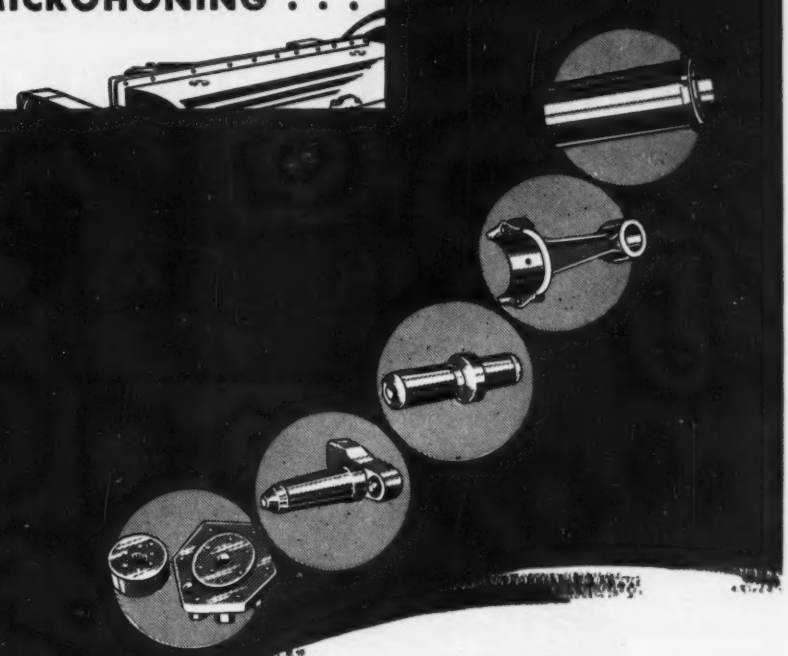
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
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(Continued on page 292)

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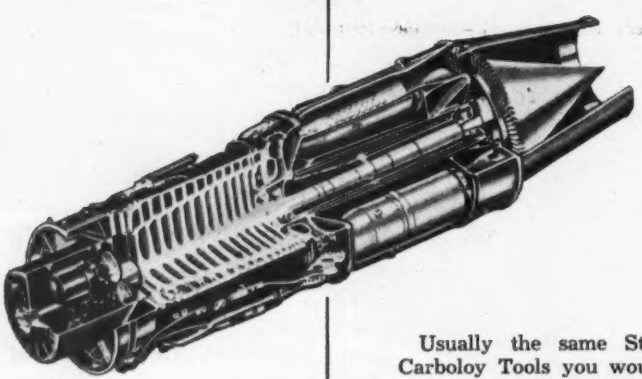
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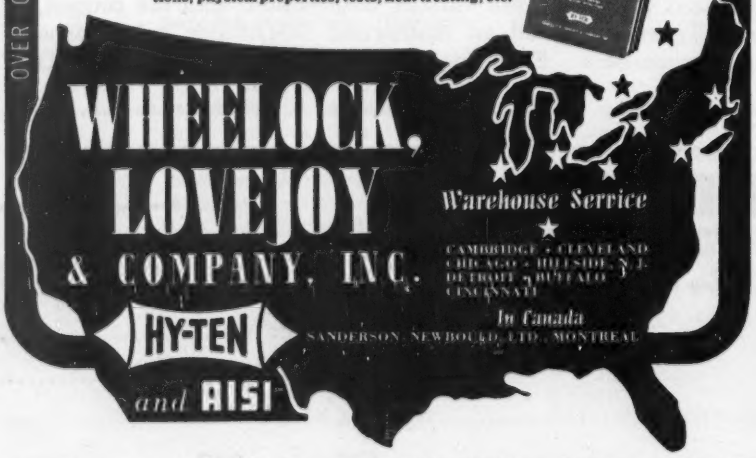
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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
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(Continued on page 296)

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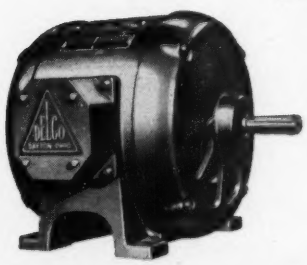
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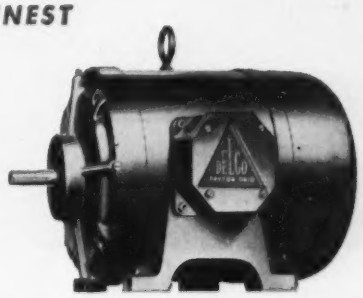
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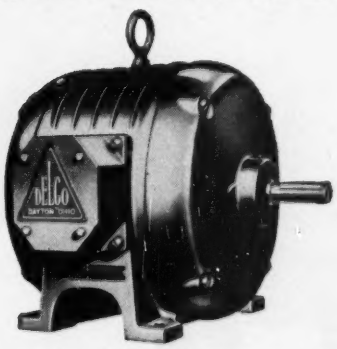


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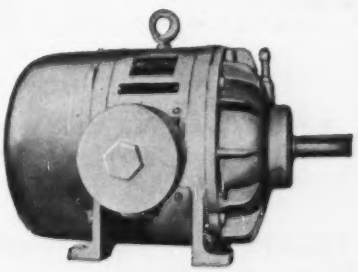


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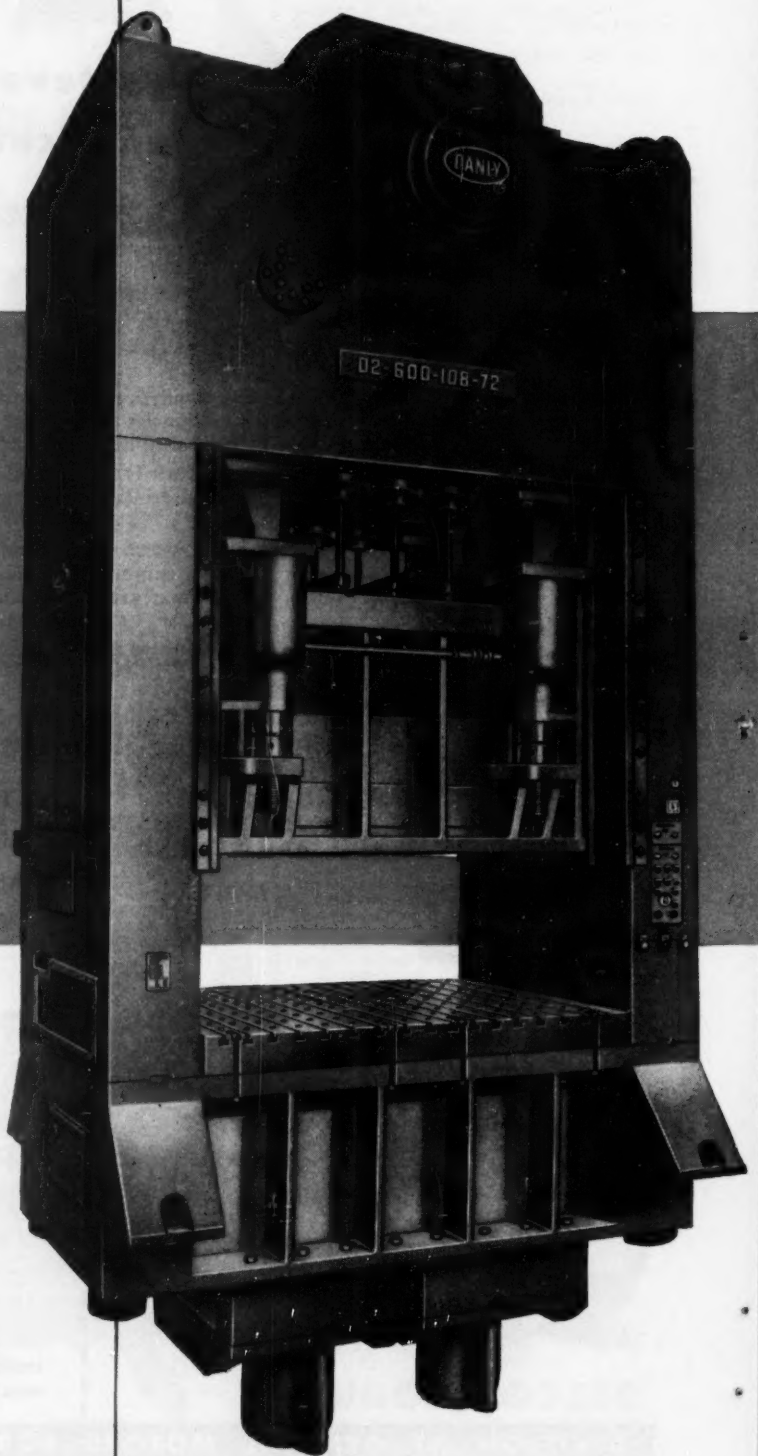
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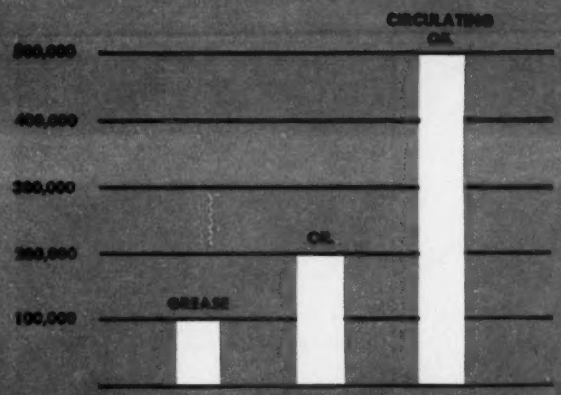
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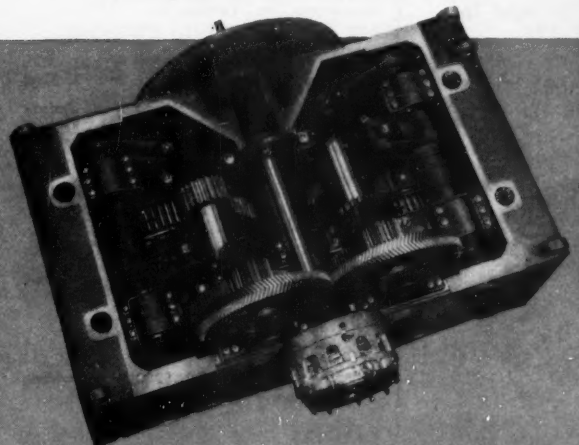
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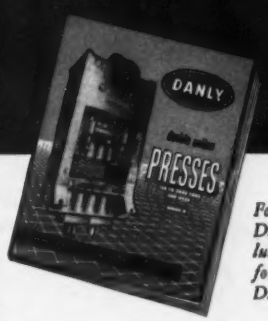


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(Continued on page 298)



CLEEREMAN JIG BORERS

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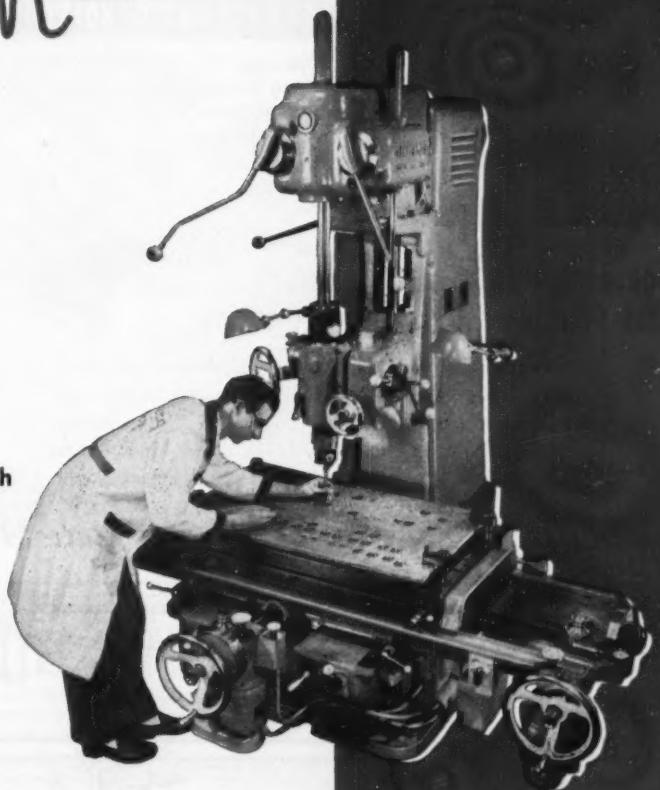
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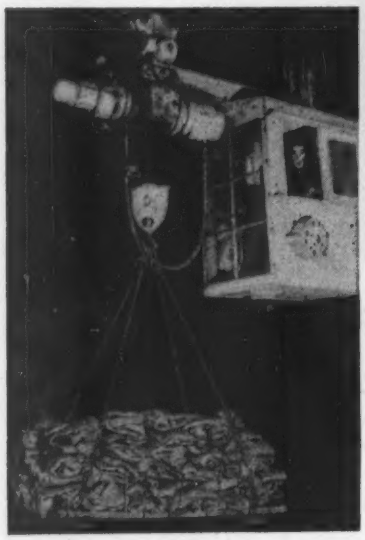
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Operator mainly occupied with other duties.





CAB-OPERATED HOIST

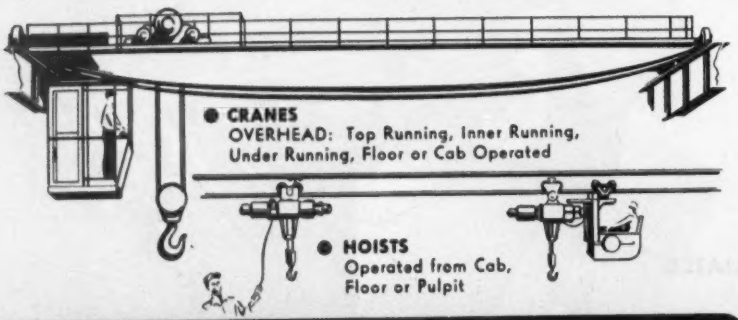
Operator in cab moves loads along at high speeds—occupies best vantage point for spotting or stacking.



Choosing the hoist that's right for your job calls for expert advice.

Let the Shepard Niles representative in your area guide you in your choice. He specializes in through-the-air handling — can help you select the hoist that fits your job. Write Shepard Niles today for Bulletins 127 and 177 — and ask to have a representative call.

Specialists in loads through-the-air since 1903



● **CRANES**
OVERHEAD: Top Running, Inner Running, Under Running, Floor or Cab Operated

● **HOISTS**
Operated from Cab, Floor or Pulpit

SHEPARD NILES
CRANE AND HOIST CORPORATION

1516 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930 W. Harrison St., Chicago, Ill.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Besly-Welles Corp., Beloit, Wis.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

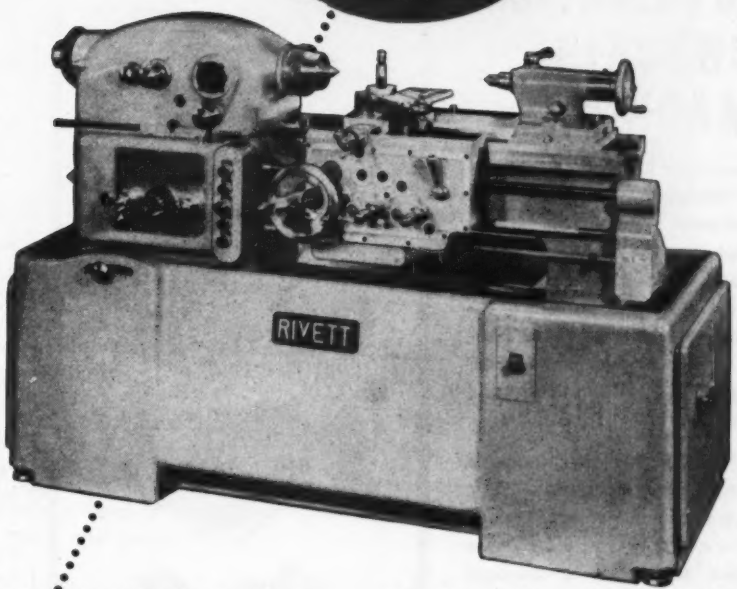
(Continued on page 300)

2 FOR 1

RIVETT 1020S

HAS WHAT IT TAKES TO MAKE AN OUTSTANDING LATHE

★ 40% heavier than comparable lathes. Weighs 3900 lbs. ★ Back gearing for power cuts—belt drive free of all gearing for high speeds. Range from 22 to 3600 R.P.M. ★ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ★ Infinite spindle speeds through trouble-free mechanical drive. ★ Push button controls for complete operation. ★ Neutral clutch stops spindle without stopping drive. ★ Three bearing mounts for spindle. ★ Collets mount directly in spindle. ★ Hand wheel for turning headstock spindle ★ Anti-friction bearings used throughout. ★ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ★ Automatic lubrication. ★ Hardened and ground feed screws.



RIVETT 1020S is an Instrument Lathe and an Engine Lathe

A double-duty machine—combining the feather-touch sensitivity of an instrument lathe with that heavy-biting ruggedness which carbide cutting tools require. This powerful geared-head lathe qualifies for any turning within its 12½" swing and 20" centers.

Bulletin 1020A has proof of how outstanding this Rivett would be in your shop. Write for copy today.



RIVETT LATHE & GRINDER, Inc.

Dept. MR-12 Brighton 35, Boston, Massachusetts

You can use other lathes . . . or employ other types of metalworking machines . . . but on no other tool can you get so much production with such fine precision as on a Rivett.

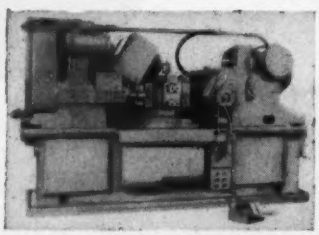


...and parts are finished without rehandling on

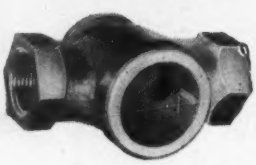
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

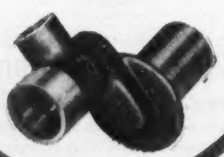
The Goss & De Leeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & De Leeuw and only Goss & De Leeuw offers this feature in a standard chucking machine.











A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Houston Grinding & Mfg. Co., 2110 Quitman St., Houston 10, Tex.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets.

CHUCKS, Diaphragm

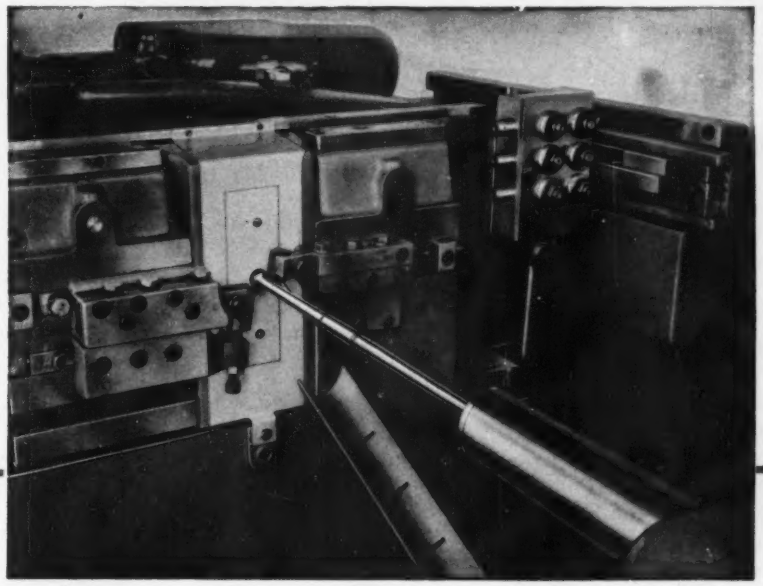
Van Norman Co., 2640 Main St., Springfield 7, Mass.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

(Continued on page 302)

TAVANNES

CAPACITIES TO
2⅜" DIA. & 21⅝" LENGTH

Single Spindle Automatic Lathe



View shows set-up to produce this 21 5/8"-long piece.

Headstock feed permits all turning operations to be performed at point of support.

Rugged construction throughout. All tool adjustments readily accessible. Camming simple to make and apply.

SIX CROSS SLIDES
SIX END TOOLS

Precision • Flexibility • High Production by TAVANNES

AMERICAN REPRESENTATIVES

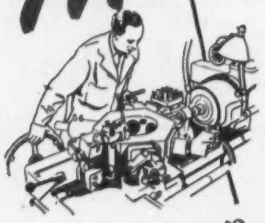
(UNITED STATES—EXCEPT WEST COAST)

RUSSELL, HOLBROOK & HENDERSON, INC.
292 MADISON AVENUE, NEW YORK 17, N. Y.

(CALIFORNIA, OREGON, WASHINGTON)

ART THOMAS MACHINERY CO.
2820 LEONIS BLVD., LOS ANGELES, CALIF.

METAL-W...ING'S *Master Clutch*

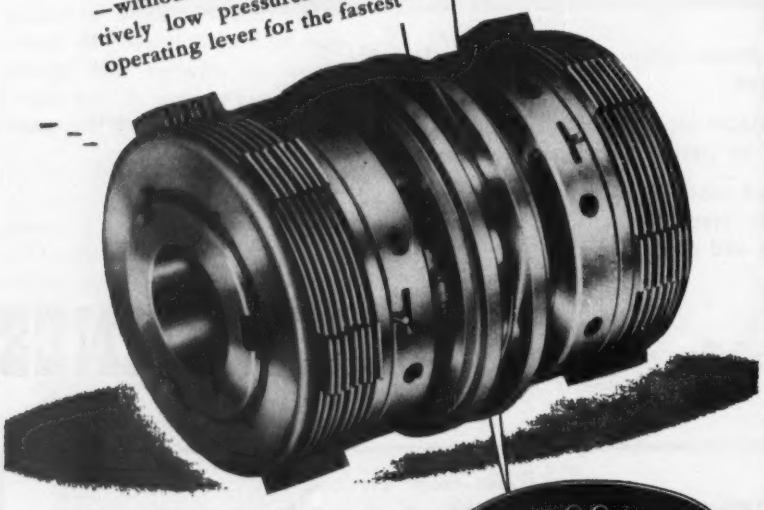


It would be interesting to speculate on how much of America's total metal-working production is on machines which are "put to work" through Twin Disc Machine Tool Clutches. For these units have so well proved their efficiency that almost every leading machine tool manufacturer in the country employs them on one or more models.

These clutches are unaffected by centrifugal action. They connect and disconnect —without lag—with comparatively low pressures on the operating lever for the fastest of work cycles. They're conservatively rated to assure the longest of wear life, with simple, single-point adjustment when needed.

Moreover, they are designed to work in very limited space and transmit, with positive clamping action, a high amount of torque. For all the reasons why Twin Disc Machine Tool Clutches—duplex or single, oil type or dry type —are the industry's standard, write today for Bulletin No. 134-A.

Fast, lag-free operation, in a compact, high torque capacity clutch is assured with Twin Disc Oil Type or Dry Type Machine Tool Clutches, offered in a complete range of capacities.



TWIN DISC CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin · HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: Cleveland · Dallas · Detroit · Los Angeles · Newark · New Orleans · Seattle · Tulsa

CHUCKS, Drill

Erickson Tool Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.

CHUCKS, Gear

Horton, E., & Son Co., Windsor Locks, Conn.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

(Continued on page 304)



You save money when you

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The *way you buy* can slice costs and insure greater convenience . . . that's why it pays to *Buy through Distributors!*

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BD Black & Decker PORTABLE ELECTRIC TOOLS

THE BLACK & DECKER MFG. CO.,
Dept. 605, Towson 4, Md.

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USS

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Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2187 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Warner Electric Brake & Clutch Co., Beloit, Wis.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

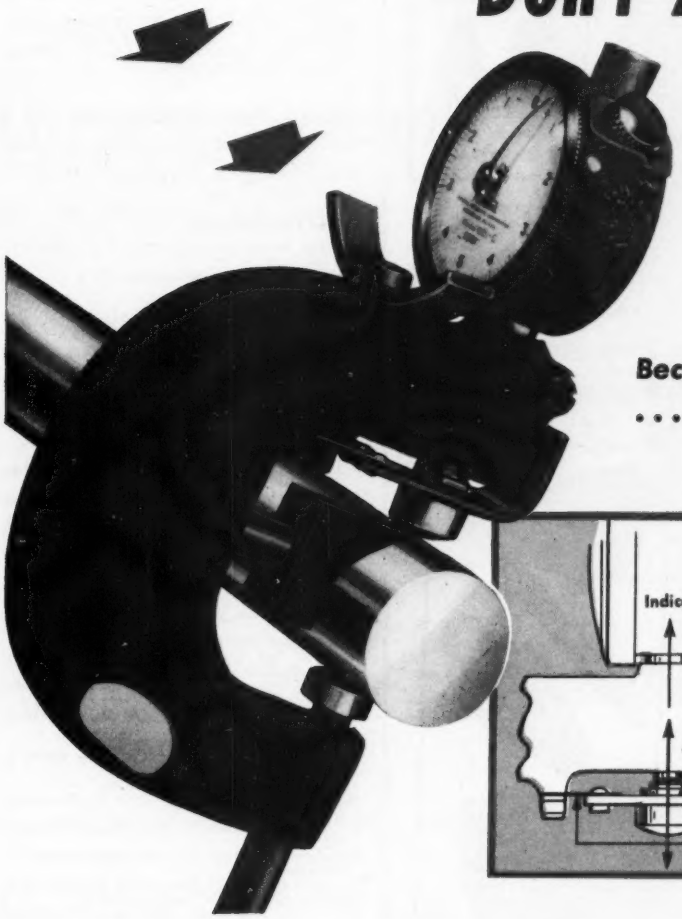
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

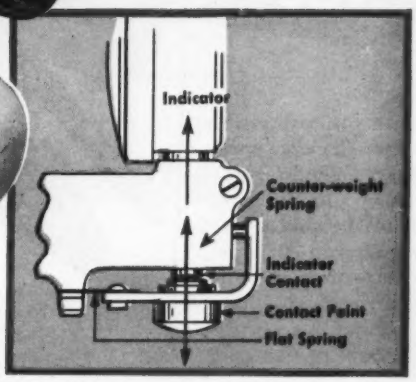
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Continued on page 306)

Side Thrusts and Friction Don't Affect this SNAP GAGE

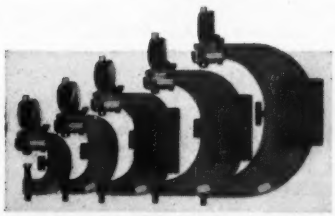


Because the Dial Indicator is free . . . while measuring the dimension



UNAFFECTED BY SHOCKS AND FRICTION

The flat spring supporting the contact point takes all the shocks and side thrusts — the indicator contact point merely rides on the gage contact point. There is no tendency for the indicator spindle to bind. Counterweight spring offsets weight of gage and of inspector's hand.



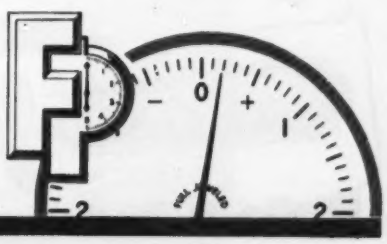
Model 1000 P-1 (0" to 1")
Model 1000 P-2 (¾" to 2")
Model 1000 P-3 (1¾" to 3¼")
Model 1000 P-4 (3" to 4½")
Model 1000 P-5 (4" to 6")
Price, any one gage with .0005" grads. $57.50
Price, any one gage with .0001" grads. $75.00
Larger sizes special

FEDERAL MODEL 1000 SERIES GAGES *show you the amount of error* so you can make corrective adjustments *before you begin to produce scrap.* Measurements are not influenced by "feel" and any operator obtains the same reading. These gages are fast, lightweight, and more accurate than conventional "go, no-go" gages.

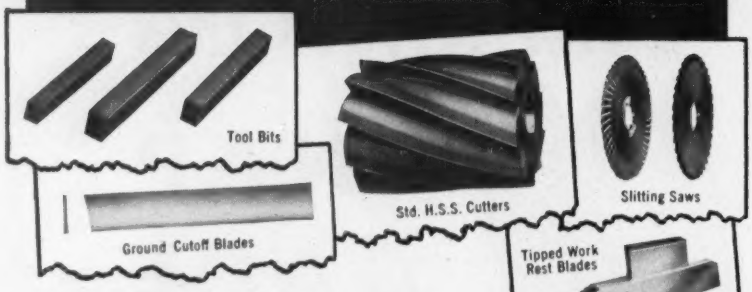
Five gages enable you to inspect *all* dimensions from 0" to 6". There are no extra gage costs when size requirements change — Adjustments can be made easily with a screw driver! Write for folder on these modern gages. Federal Products Corporation, 1112 Eddy Street, Providence 1, R. I.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



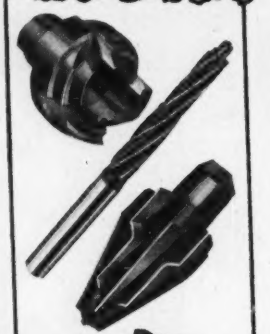
If you buy Cutting Tools





HERE'S HELP FOR YOU!

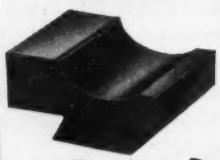


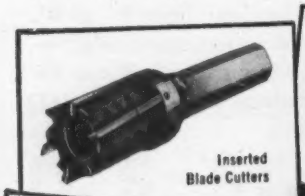


Are you responsible for purchase or specification of cutting tools —or wear and abrasion-resistant parts? You'll find the *Gorham* Tool Catalog a *helpful time saver!* 120 pages, packed with useful information, describe and illustrate the complete *Gorham* line—*PLUS* an informative section of Engineering Data. Request your free copy on company letterhead.

We also offer the service of *Gorham* field engineers, whose counsel in specification and design for special tooling problems is yours for the asking. Their recommendations are backed by *Gorham's* 25-year background in tool design, manufacture and heat treatment. Write for the name of your nearby *Gorham* representative.













Gorham
TOOL COMPANY
14405 WOODROW WILSON
DETROIT 3, MICHIGAN

National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana) 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

COMPOUNDS, Resin and Molding

Bakelite Co. Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC.

Hapman Conveyors, Inc.

COOLANT TABLES

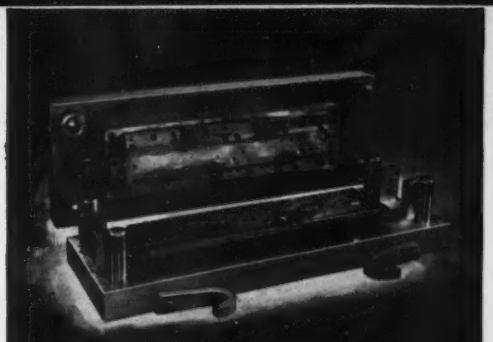
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.

COUNTERBORES

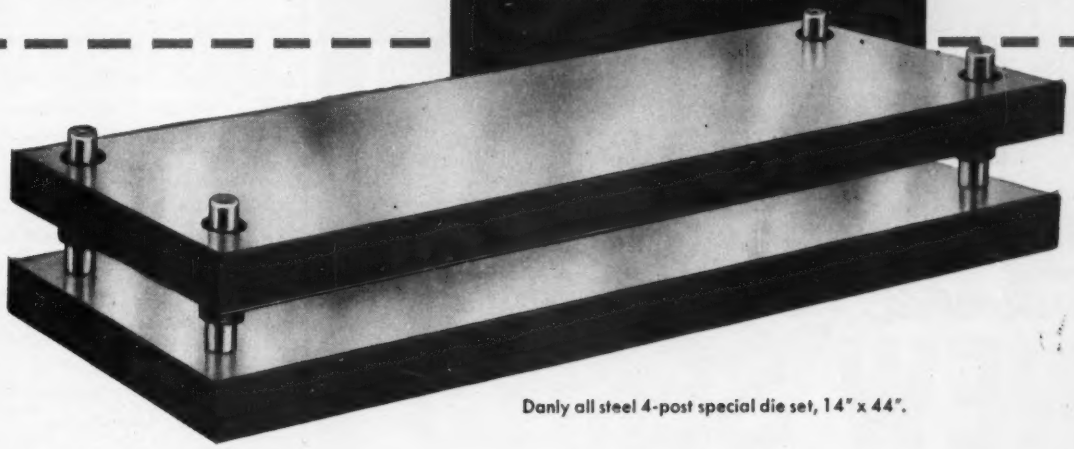
Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.

(Continued on page 308)

DANLY SPECIAL DIE SETS



Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set.



Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

***CHICAGO**	50	2100 South Laramie Avenue
***CLEVELAND**	14	1550 East 33rd Street
***DAYTON**	7	3196 Delphos Avenue
***DETROIT**	16	1549 Temple Avenue
***GRAND RAPIDS**		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
***LONG ISLAND CITY**	1	47-28 37th Street
***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
***PHILADELPHIA**	40	511 W. Courtland Street
***ROCHESTER**	6	33 Rutter Street

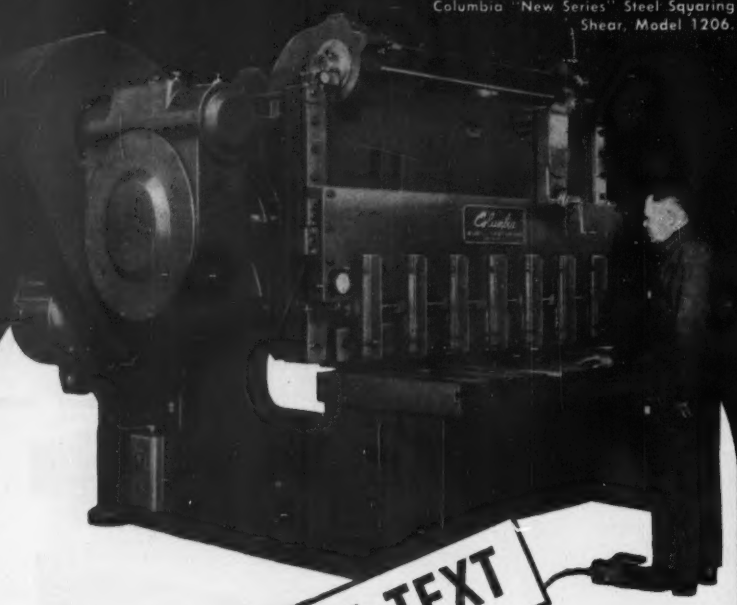
**Indicates complete stock*



View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash Kelvinator Corporation in Milwaukee, Wisconsin.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES



Columbia "New Series" Steel Squaring Shear, Model 1206.

SEE TEXT

Columbia

NEW SERIES

STEEL SQUARING SHEARS

MODEL 1206

Capacity	6' x ¾"
Operating Speed	30 SPM
Blade Section	1½" x 5½"
Blade Length	77"
Rake of Blade	½" per foot
Width Between Housings	6' - 4"
Approximate Hold Down Pressure	24T
Fly Wheel Speed	600 RPM
Motor	20 HP

This shear has a ram which is adjustable for slitting, air operated disc clutch, air counterbalances with adjustable pressure control, motorized micrometer back gauge with swing-up back gauge angle, spring loaded ball transfers on table, fully automatic lubrication, and automatic hydraulic hold downs.

This is one of more than thirty models in the Columbia "New Series" line of steel squaring shears. All "New Series" Columbia Shears offer exclusive engineered features, to be had in no other make.

Excellent delivery on most models.

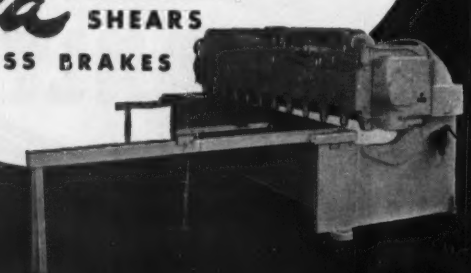
For complete description of Columbia's "New Series" Shears, write for Bulletin 5241. Address Columbia Machinery & Engineering Corporation, Hamilton 1, Ohio.

new series

Columbia

STEEL SQUARING SHEARS

and POWER PRESS BRAKES



Capacities: 3/16" to 1¼" in mild steel.

National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES, Hand Traveling

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

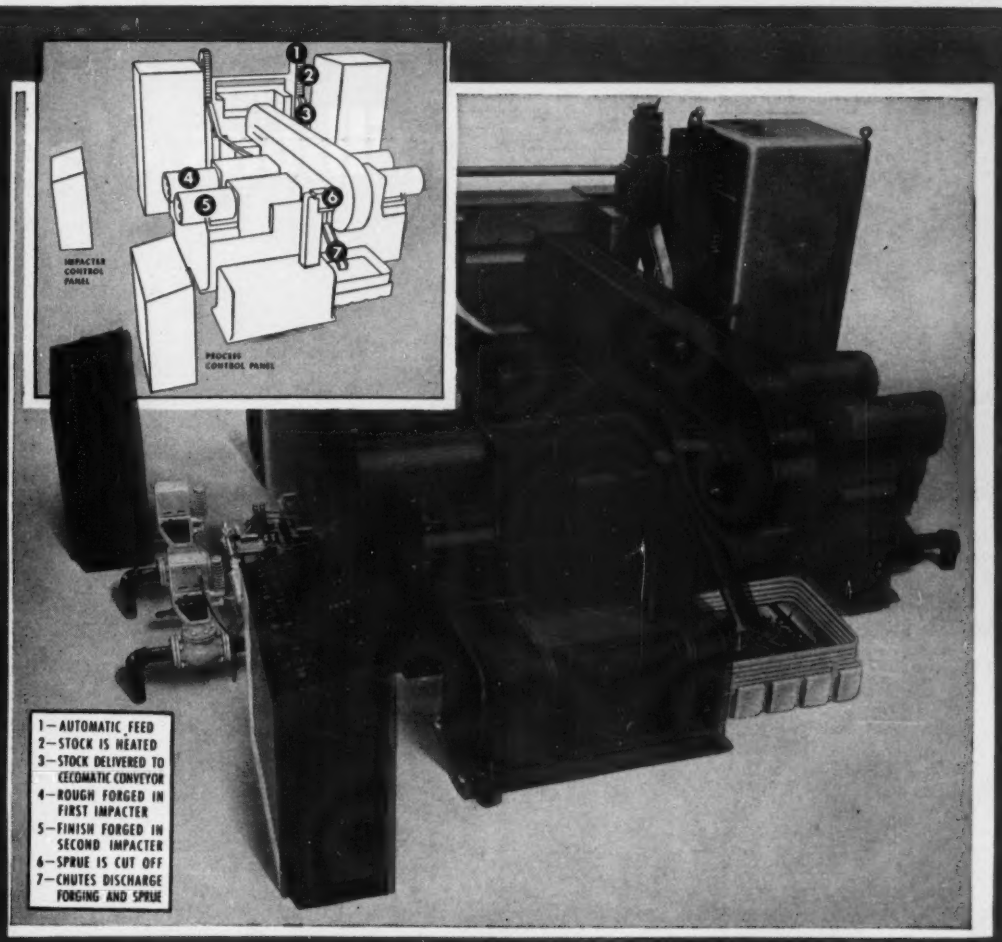
CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).

(Continued on page 312)



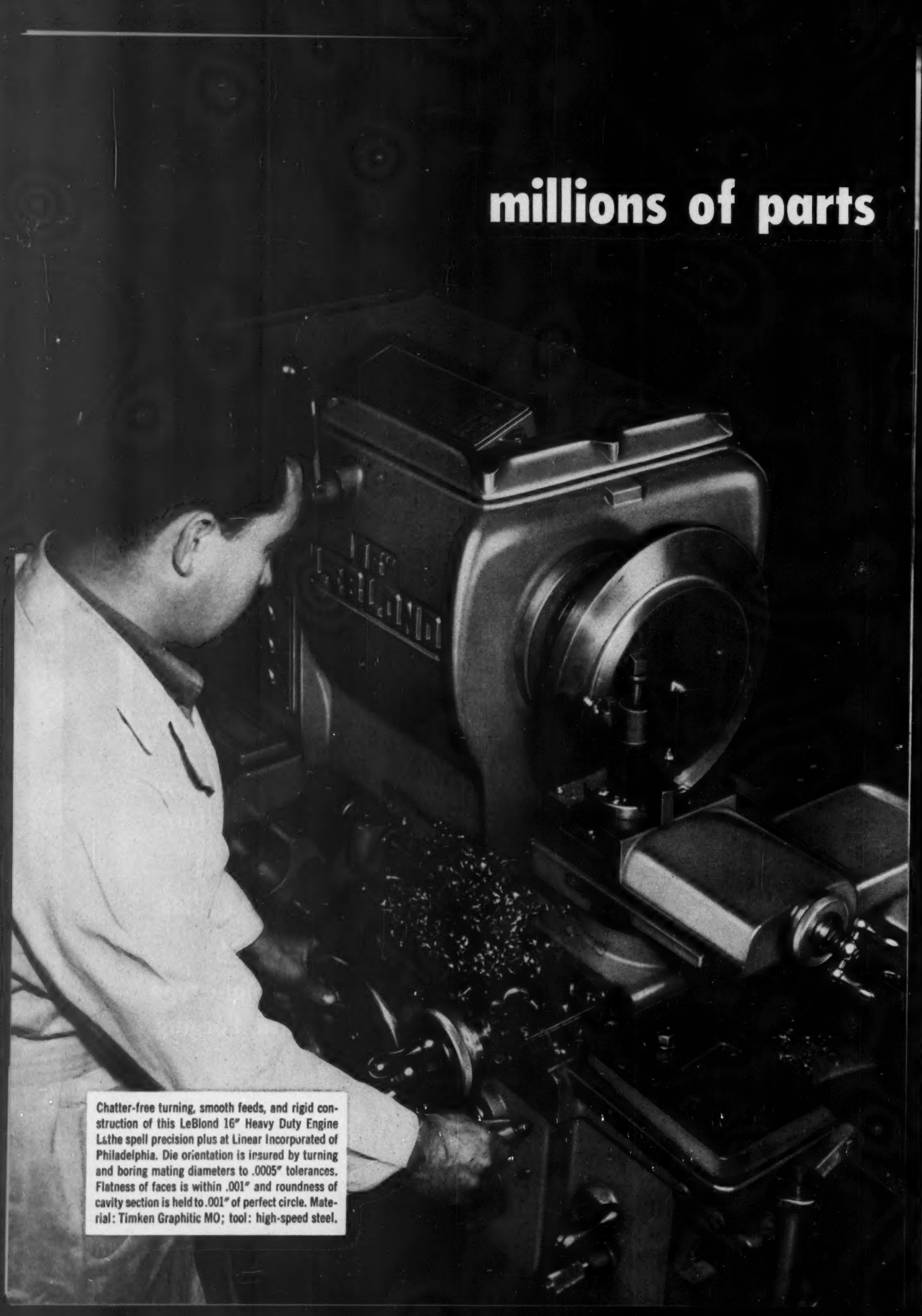
A new method for the automatic mass production of "drop forgings" is announced by Chambersburg Engineering Company.

The method is called Impacting; the process (illustrated above) the Cecomatic Forging Process.

The Chambersburg Impacter, a new and unique type of hammer, is the basic tool of Cecomatic Forging.

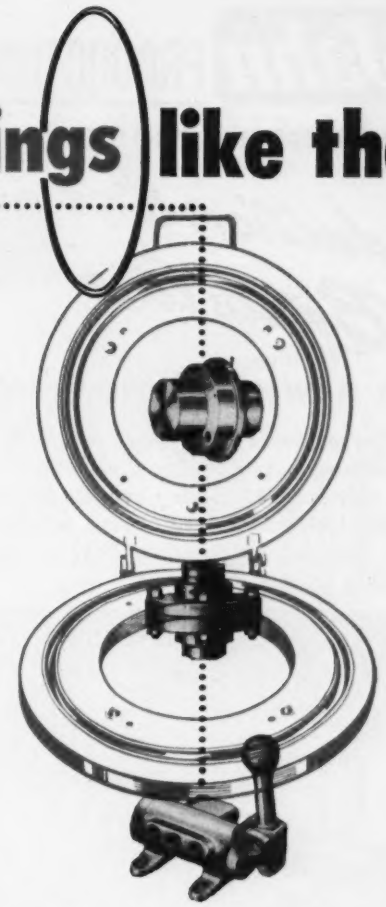
CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

millions of parts



Chatter-free turning, smooth feeds, and rigid construction of this LeBlond 16" Heavy Duty Engine Lathe spell precision plus at Linear Incorporated of Philadelphia. Die orientation is insured by turning and boring mating diameters to .0005" tolerances. Flatness of faces is within .001" and roundness of cavity section is held to .001" of perfect circle. Material: Timken Graphitic MO; tool: high-speed steel.

are married with rings like these



Industry needs sealing rings to "marry" millions of parts against leakage of air, liquid, and gas. Seals, for example, like the rubber "O" rings made by Linear Incorporated of Philadelphia. They're vital to the successful operation of hydraulic mechanisms, air-operated devices, and chemical processing equipment . . . to name just a few applications. And industry says, "Make these sealing rings to precision tolerance for non-leakage. Deliver the millions we need at low cost."

Linear experimented . . . found that "O" rings with the required finish and roundness could be mass-produced easily enough . . . but to turn them out at low cost demanded virtual elimination of hand-finishing operations. The problem called for dies made to tolerances that would deliver cross-sectional roundness conforming to nearly "perfect circle," mating diameters so accurate that perfect die orientation could be achieved.

Then Linear installed their new 16″ LeBlond Heavy Duty Engine Lathe. This profit-building lathe is saving expensive toolroom time and delivering cavity finish on Linear's dies as fine as 10 microinches, mating diameters to the required .0005″ whisker of tolerance, cross sectional roundness within .001″ of perfect circle. Costly die-finishing time at Linear is down . . . flash-removing second operations on "O" rings are at a bone-bare profit-making minimum. It's a case of chatter-free turning, smooth-as-silk feeds, and rigid construction.

LeBlond features like hardened and ground self-compensating steel bed ways, totally enclosed quick-change box, one-piece apron and a host of others will insure Linear a lifetime of this same smooth-turning performance.

Whether you need unfaltering accuracy or high output rapid production, there's a LeBlond lathe that will fill the bill. Your nearby LeBlond distributor will tell you about our complete line. Call him or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin HD125 D
for more information on the 16″
LeBlond Heavy Duty Engine Lathe

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

B. Jahn PRODUCTION PROVED DIES

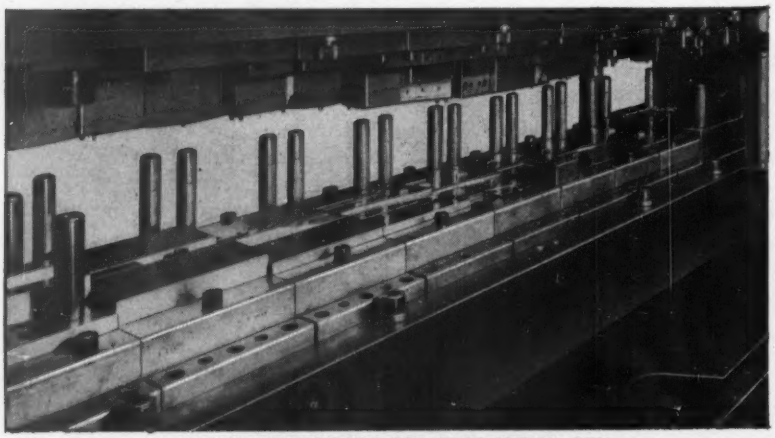
speed carbine magazines from—

Production line to Battle line

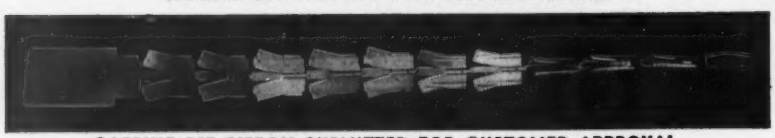


with new efficiency and economy!

Another evidence of B. Jahn versatility and ingenuity is this mammoth progressive die—one of the largest of its kind ever built! Measuring over six feet in length, this vital defense tool produces *40* carbine magazines per minute—each identical! Each perfect! Each an example of flawless "proving ground" accuracy!



CARBINE DIE "SET UP" FOR PRODUCTION RUN



CARBINE DIE RIBBON SUBMITTED FOR CUSTOMER APPROVAL

THIS—LIKE EVERY B. JAHN BUILT DIE—WAS PRODUCTION PROVED TO ELIMINATE ALL ERROR, ALL CHANCE, ALL UNCERTAINTY AND TO GUARANTEE A FINER DIE PRODUCT!

In B. Jahn's modern plant, presses run 10 to 50,000 parts for customer's actual assembly line use *before the die is certified PRODUCTION PROVED and shipped!* B. Jahn's guarantee: *the die must work in the customer's equipment to his unqualified satisfaction!*



SEND TODAY for the "Story of B. Jahn PRODUCTION PROVED DIES!"

PRODUCTION B. Jahn PROVED

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co, 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files and Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.

(Continued on page 314)



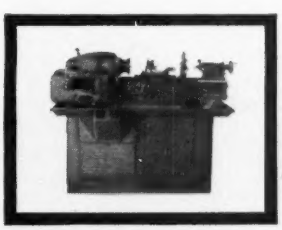
NEW!

...another product from the plant of precision!

9" x 24" Tool and Gage-Makers' Lathe with Electronic Motor Control

Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



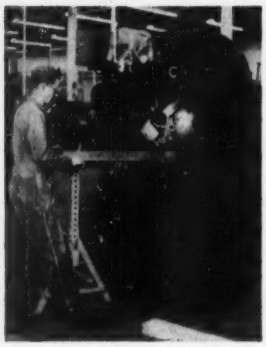


MODERN Hendey

THE HENDEY MACHINE COMPANY
MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh



With their No. ½ "Buffalo" UNIVERSAL IRON WORKER*, a well-known electrical manufacturer accomplishes in just a half-day fabrication operations which formerly required nine days! Similar astonishing time savings are being affected throughout the metal working industries with these versatile punching-shearing-bar cutting-mitring-coping-notching machines. Top photo shows two operations going on at once: (1) man on left is punching holes in the leg of an angle and (2) man at right is coping an angle.





ABOVE, **ANGLE MITRE is just one of many jobs the U. I. W. handles. Just below angle stripper is stripper for round and square bars, always in position. For complete information on the seven models available, write for Bulletin 322-O.**

LEFT, **the U. I. W. PUNCHING AND SHEARING SIMULTANEOUSLY. Note stripper at shear and holding flat tightly against bottom knife. Easy maintenance is assured by centralized oiling system.**

"Buffalo" MACHINE TOOLS

75th ANNIVERSARY

BUFFALO FORGE COMPANY

440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Mch. Div., American Chain & Cable, 929 Conn. Ave. Bridgeport Conn.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.

CYLINDERS, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S. Corp., Rockford, Ill.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Logansport Machine Co., Inc., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Hill-Clarke Machinery Co., 648 W. Washington, Chicago 6, Ill.

(Continued on page 316)

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horizontal boring machines

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Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

DIAMONDS AND DIAMOND TOOLS

Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

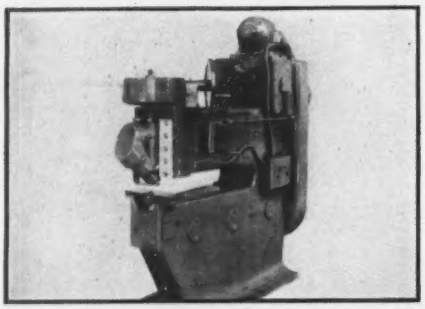
DIE-CASTING

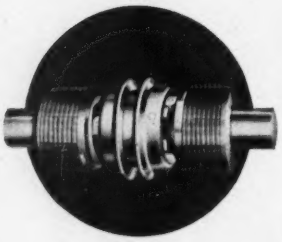
See Castings, Die.

DIE-CASTING MACHINES

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Kux Machine Co., 3930 W. Harrison St., Chicago, Ill.

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Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE CUSHIONS

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Grob Bros., Grafton, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.

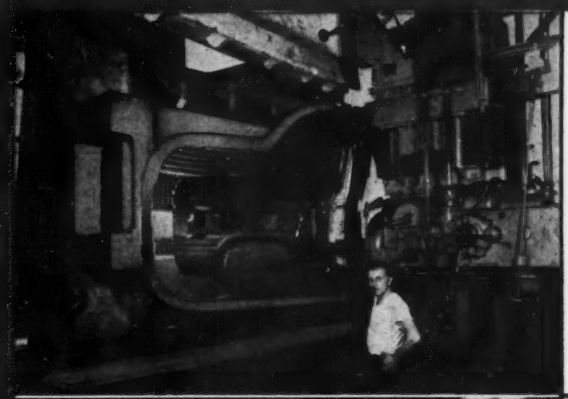
DIES, Sheet Metal, Etc.

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.

(Continued on page 318)

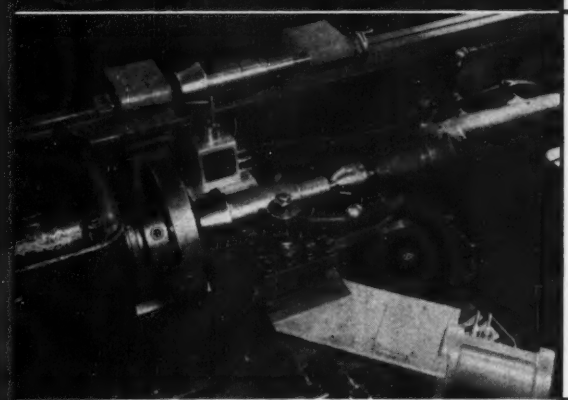
Bring your standard machines up-to-date with

Turchan HYDRAULIC DUPLICATORS



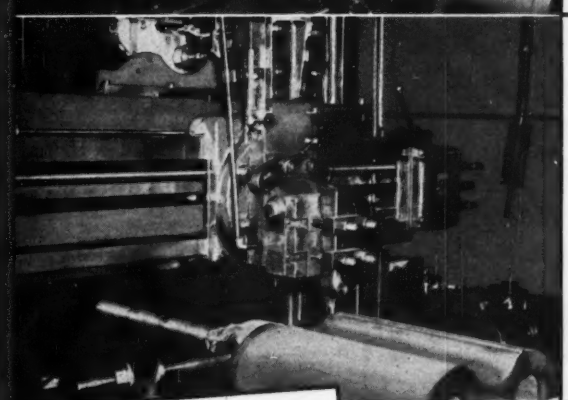
MILLING...

The Turchan Follower attachment will transform those difficult tasks to simple push-button operation on your standard horizontal or vertical millers. Irregular profiles and contours; machining of dies, forms and moulds are achieved automatically. Hydraulically controlled cutting tools reproduce directly in metal, the exact dimensions of the model or template. No costly form tools or skilled help necessary. Close accuracies and extremely fine surface finish are cost-cutting features that save rejects. Turchan users report savings of 80% to 600% over old methods.



TURNING...

Thousands of lathes in shops all over America, are increasing efficiency and speeding production with Turchan duplicators. The single attachment is pictured machining a stepped shaft. The Turchan replaces the regular cross slide; operates at 45° angle, taking uninterrupted cuts over the work. Square or tapered shoulders, radii, grooves, bevels and undercuts, as well as facing, are all taken in stride to accuracies of .001". There is also a Turchan *dual* 45° lathe attachment which actually doubles tool approach to the work. Any size or make of conventional lathe can be Turchan equipped.



PLANING...

Standard planers equipped with the Turchan will duplicate irregular shapes, such as this blower section as readily as straight work. Contours are obtained automatically, with precision results. After job set-up, which is greatly simplified with the Turchan, little more than loading and unloading the work need be done. Once again skilled help is not required, yet production multiplies rapidly. Turchan Followers are also available for ordinary shapers and grinders. The attachment in no way interferes with the conventional controls of the machine tool. "Turn to Turchan to cut cost."



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Tells how to get more and better work from your present machines, without skilled help and special tools.

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Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., Detroit, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

Besly-Welles Corp., Beloit, Wis.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DIVIDING HEADS

See Index Centers.

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

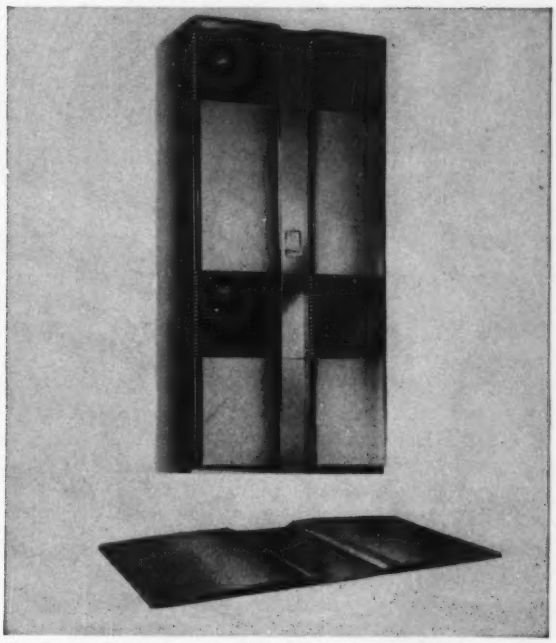
Carboloy Dept., General Electric Co., Box 237, Rooseveit Park Annex, Detroit 32, Mich.

(Continued on page 320)

The trend is to more stampings WITH BLISS PRESSES...



1200 14-gauge drip pans are drawn and formed daily in this Bliss press which has a 400-ton blankholder pressure and 200-ton plunger capacity.



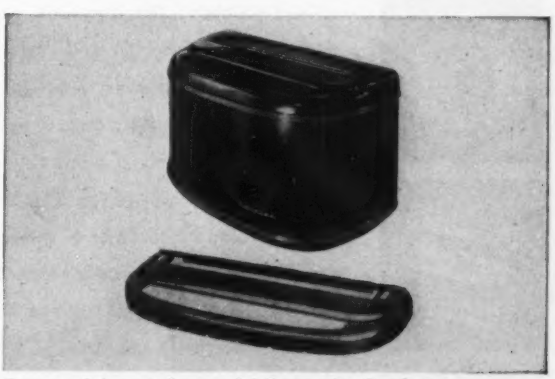
Hard-to-make contours in this center-section stamping for a Weathermaker are drawn from 20-gauge steel at the rate of 1800 daily.

Versatile Bliss Hydro-Dynamic Allows Unusual Metal Design

A new 600-ton Bliss double-action Hydro-Dynamic press helps Carrier Corporation produce nice-to-look-at but tough-to-make contours for its line of air conditioners.

Carrier's Vice President of Manufacturing reported that, "By varying ram, blankholder and cushion pressures and the draw cycle, we have been able to complete difficult drawing operations with sharp corners and small radii at the bottom... Actually, the press has exceeded our expectations."

Top performance? Of course—but it's all a matter of picking the proper press. It's what Bliss engineers mean by "the *right* press for the job."



Top panel for window-model Room Air Conditioner has intricate contours, sharp corners and bottom radii. Yet Carrier was able to produce them at the rate of 1200 per eight-hour shift.

E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, Drill

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

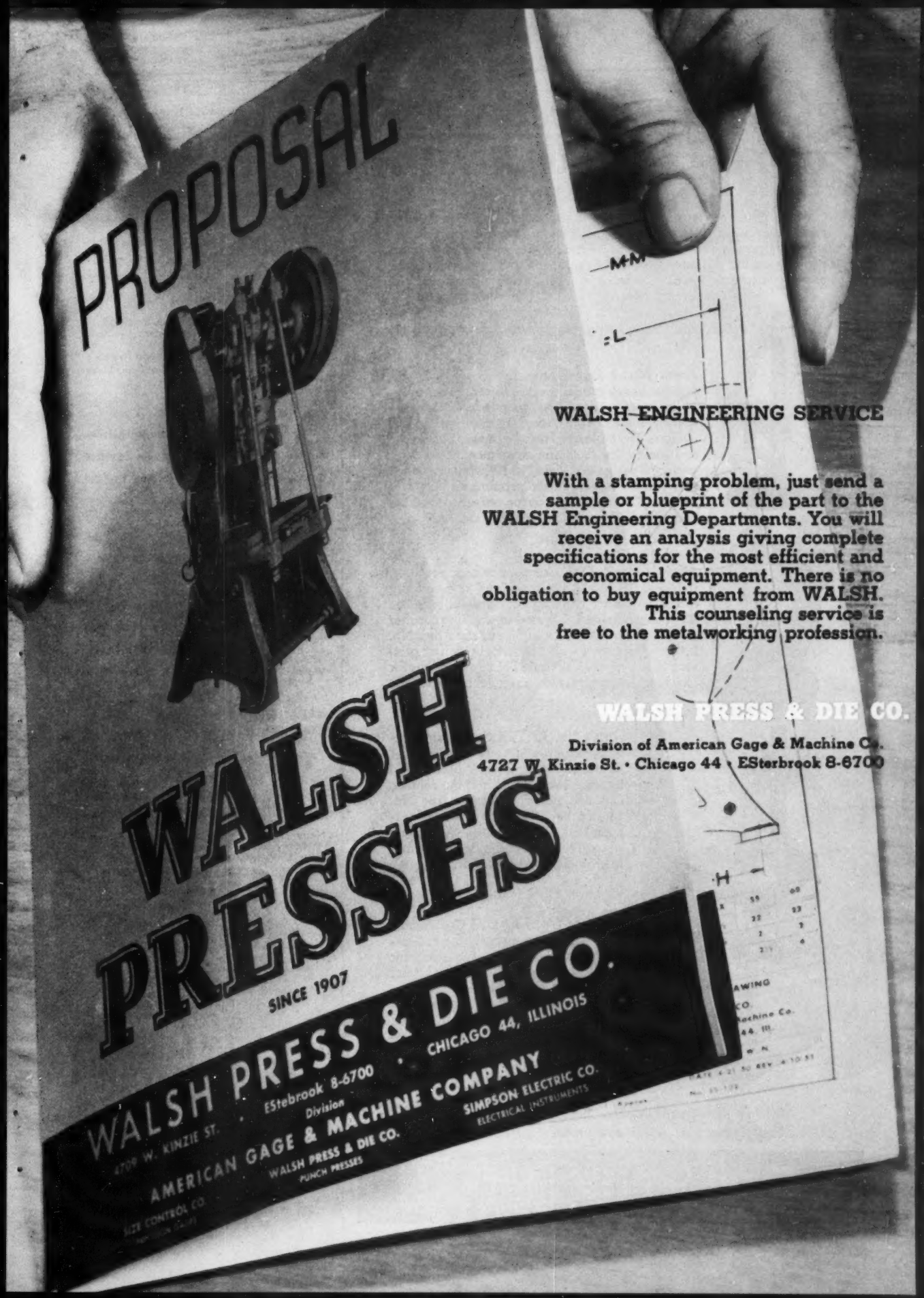
DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILLING ATTACHMENTS, Chip Breaker Type

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.

(Continued on page 322)


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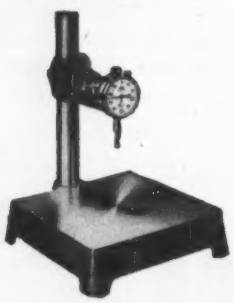
Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.



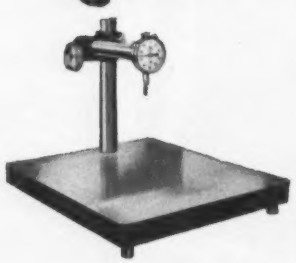
Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.



Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.



Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

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Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave, Bellwood, Ill.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Atlas Press Co., 1253 No. Pitcher St., Kalamazoo, Mich.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Dumore Co., 1300 17th St., Racine, Wis.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

DRILLING MACHINES, Deep Hole

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Gang

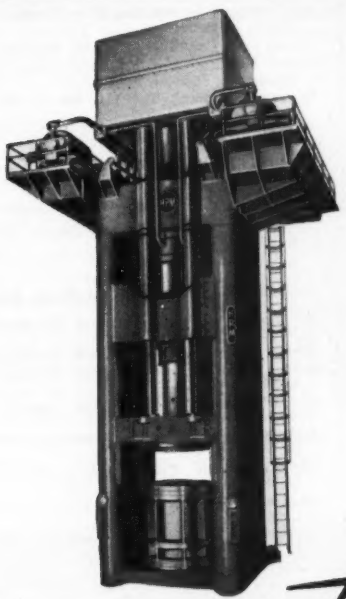
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St, Moline, Ill.
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(Continued on page 324)

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Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St, Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

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National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

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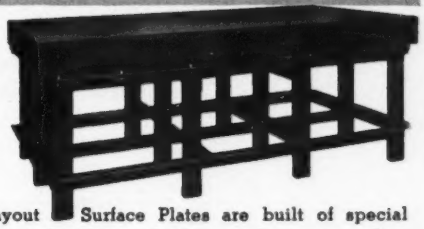
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
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Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
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Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 326)

CHALLENGE

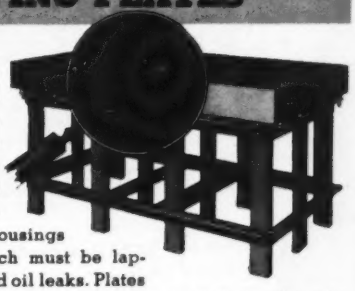
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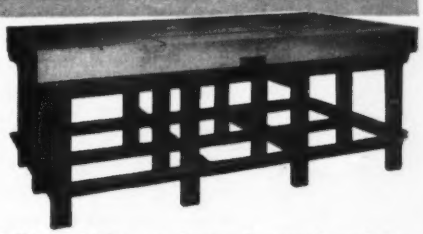
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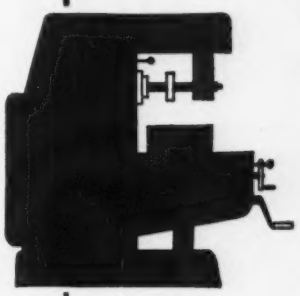
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Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Atlas Press Co., 1253 No. Pitcher St., Kalamazoo, Mich.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.

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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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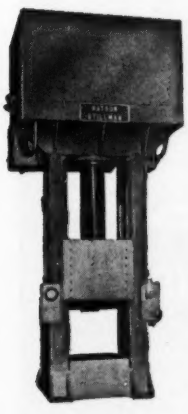
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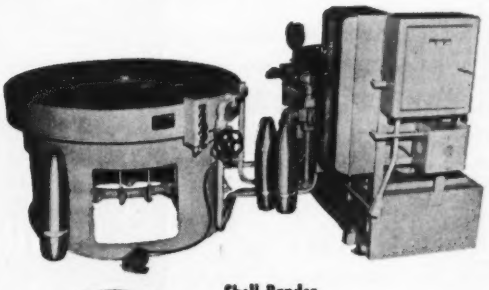
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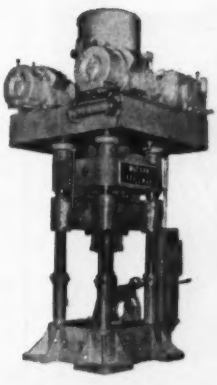
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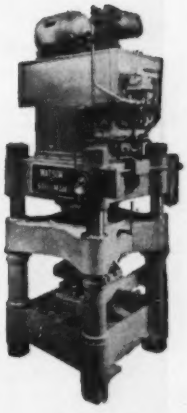
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Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
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Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
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Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLS, Ratchet

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

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Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

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EMERY WHEELS

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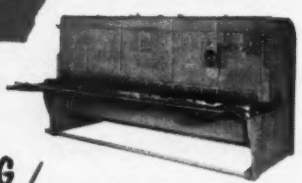


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Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

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Federal Press Co., 600 Division and Big Four R. R., Elkhart, Ind.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FELT, For All Applications

American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jarvis, Chas. L., Co., Middletown, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob Bros., Grafton, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air

American Air Filter Co., Inc., Louisville, Ky.

FILTERS, Coolant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Cuno Engrg. Corp., Meriden, Conn.

(Continued on page 332)


RED RING
INTERNAL-EXTERNAL
GEAR SHAVING
MACHINES
For the Precision
Finishing of Gears
Up To 120" PD
Other models available for gears
up to 220" PD
Red Ring
SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM
NATIONAL BROACH & MACHINE CO.
5600 ST. JEAN • DETROIT 13, MICHIGAN

FINISHES FOR MACHINES AND METAL PARTS

Lowe Bros. Co., Dayton, Ohio.

FLEXIBLE COUPLINGS

See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT

Dumore Co., 1300 17th St., Racine, Wis.
Jarvis, Chas. L., Co., Middletown, Conn.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

FORGING (Upsetting) MACHINES

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Mahon, R. H., Co., Detroit 34, Mich.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

FURNITURE, Shop

Standard Pressed Steel Co, Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St, New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Watham St., Watertown, Boston, Mass.
Webber Gage Co., 12909 Triskett Rd., Cleveland 11, Ohio.

(Continued on page 334)



Huge, Rebuilt Lathe operates *Smoother Faster* with Farrel® Gears

In rebuilding a giant, 100" lathe, Simmons Machine Tool Corporation, of Albany, N. Y., used Farrel-Sykes herringbone gears to replace spur gears on the two final gear reductions.

With these new gears, Orange needle bearings for the shafts and a pressure lubrication system, Simmons was able to *double* the normal spindle speeds of the machine. On test, they found the rebuilt lathe to be "exceptionally smooth and quiet in operation."

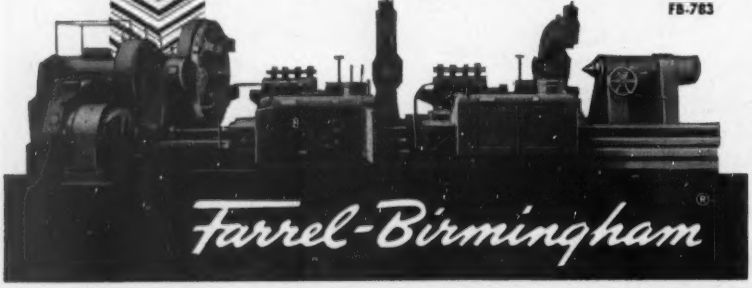
The quiet, vibration-free performance of Farrel-Sykes gears results from extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. They are made of the finest grade materials, in a complete range of sizes.

Information and engineering assistance available, without obligation.

FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

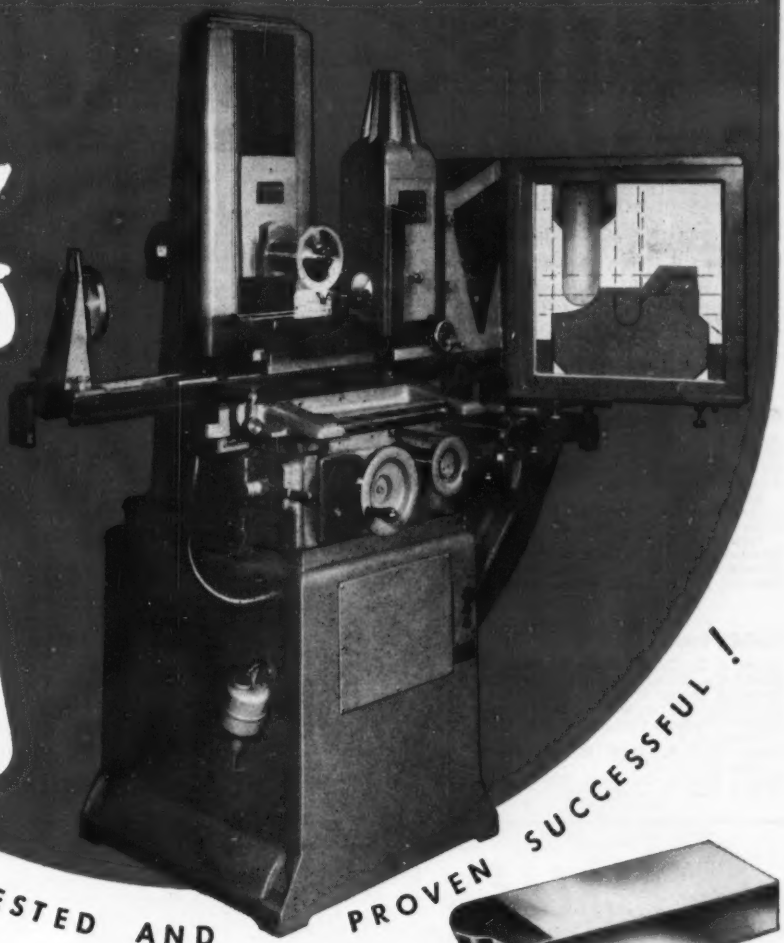
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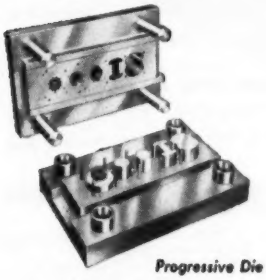
Farrel-Birmingham

Positive Results with VISUAL GRIND

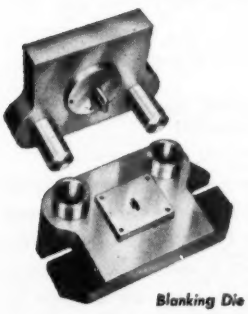
TRADE MARK



TESTED AND PROVEN SUCCESSFUL !



Progressive Die



Blanking Die

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin "M-12"

Flat Form Tool



Circular Form Tool



Dovetail Tool

VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

1643 EDDY ROAD • CLEVELAND 12, OHIO

New Possibilities in Optical Grinding

GAGES, Air

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

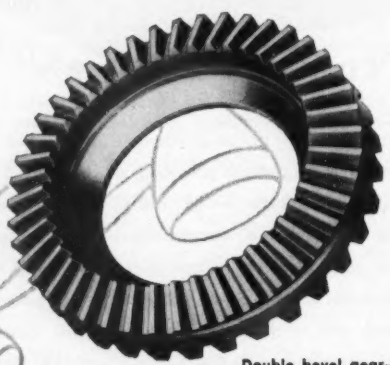
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

(Continued on page 336)

Bramble-7700

BRamble 7700 is our telephone number in Cincinnati. If you have a gear problem, call us—we would enjoy discussing it with you. We have been helping industry since 1907, and we can undoubtedly help you, too.

We are proud of our craftsmen, proud of our gears, proud of our reputation for quality. And we are proud of the fact that our customers can deal with us with complete confidence—an established, reputable firm with whom you, too, will enjoy working.



Double bevel gear—used in post hole digger

Spur	Internal
Helical	*Coniflex Bevel
Worm	Spiral Bevel
Herringbone	Spline Shaft

*Reg. U. S. Pat. Off.

For full information, write, wire, or call BRamble 7700.



THE CINCINNATI GEAR COMPANY

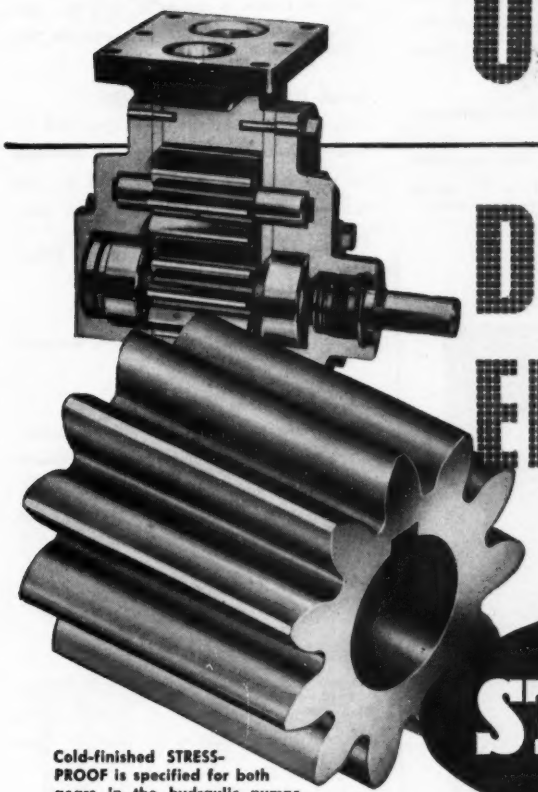
"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

CARBURIZING UNNECESSARY

DISTORTION ELIMINATED

ON THIS ANTHONY PUMP GEAR WITH . . .



Cold-finished STRESS-PROOF is specified for both gears in the hydraulic pumps made by Anthony Co., Streator, Ill.

STRESSPROOF®

SEVERELY COLD-WORKED, FURNACE-TREATED, COLD-FINISHED STEEL BARS

STRESSPROOF has been specified for years for this Anthony hydraulic gear. Gears made of STRESSPROOF have the high accuracy required for quiet, efficient operation. Also, they will run for the life of the equipment without appreciable wear or pitting.

Carburized gears, the alternate for STRESSPROOF, distort in hardening. Costly finishing operations are then required or noisy, inefficient gears result. STRESSPROOF, on the other hand, is used as machined . . . gives accurate, highly finished gears with long, trouble-free life.

STRESSPROOF's value to manufacturers like Anthony Company stems from its unique combination of four important qualities in the bar—(1) *high strength;* (2) *machinability;* (3) *wearability;* and (4) *minimum warpage.* STRESSPROOF costs less than other quality cold-finished bars. It is available in cold-drawn or ground and polished finish.

SEND FOR Free Engineering Bulletin "New Economies in the Use of Steel Bars."





La Salle STEEL CO.

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Hammond, Indiana

Please send me your STRESSPROOF Bulletin.

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Title_____

Company_____

Address_____

City_____ Zone___ State_____

GEAR CUTTING MACHINES
Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).



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DETROIT DIE SET ★

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

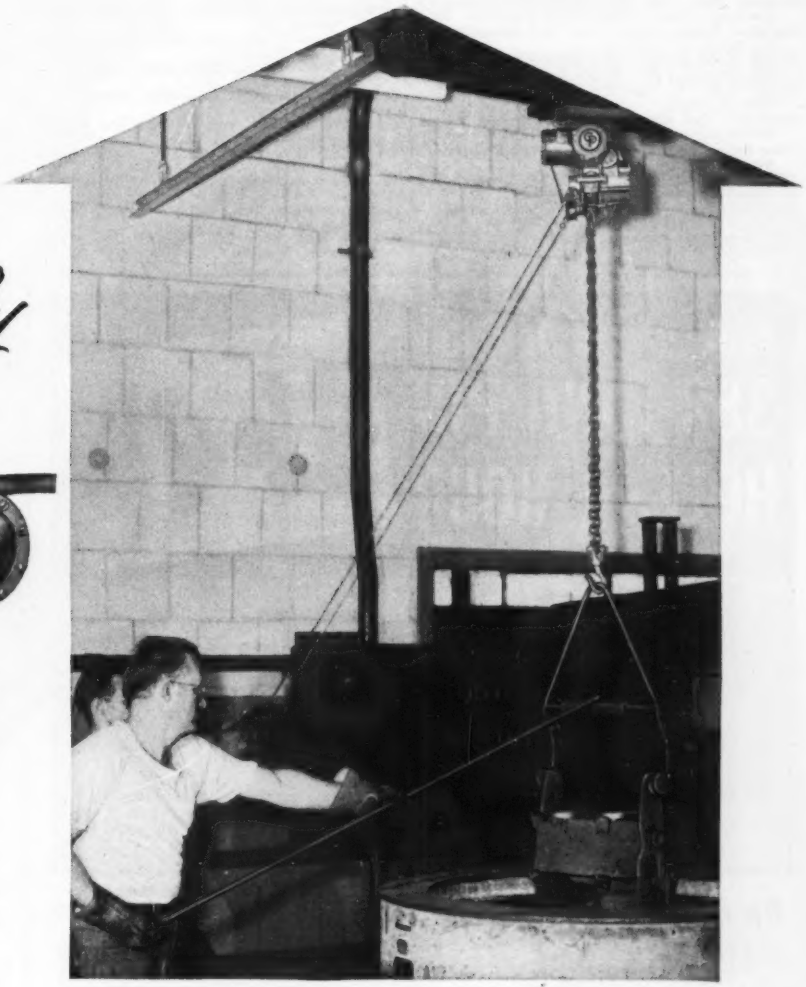
American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Miamont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.

(Continued on page 338)

spots a load quickly-

sets it down gently





Fast and easy operation, outstanding features of the new CP AIR HOIST, are made possible by its variable speed, rotary vane air motor and its highly responsive throttle control.

It can lift a thousand pounds twenty feet a minute — or its speed may be reduced to an almost imperceptible creep.

Its air motor cannot overheat, and has no shock or spark hazard, no switches to maintain.

Automatic braking is provided by self-locking worm gear — no brake bands to adjust or replace.

A millwright can readily carry Air Hoist to any location, since it weighs only 57 pounds.

Furnished in 300, 500, 700 and 1,000 pound capacities.

CP Fiftieth ANNIVERSARY

Write for Bulletin SP-3027.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

GOGGLES

American Optical Co., Southbridge, Mass.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

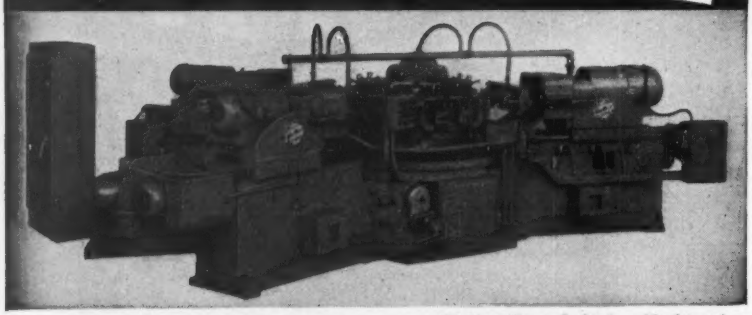
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Skil Corp., 5039 Elston Ave., Chicago, Ill.

(Continued on page 340)

Drilling and Reaming
388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

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Davis & Thompson Company
6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN



SWISS BLUE RIBBON PRECISION MACHINE TOOLS

Backed right here in the U.S. by skilled technicians, factory service and guarantee, and spare parts readily available from every Hirschmann Branch.

Typical as to precision and as to fame of trade name. Tornos R10 Swiss Automatic Screw Machine.

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Keyless Drill
DIAMOND & OTHER ABRASIVE WHEELS
DIE SETS
DIE SINKERS
DRILLING & TAPPING MACHINES
FINISHING MACHINES
Precision
FORMING & CUTTING-OFF MACHINES
Automatic
GEAR HOBBING MACHINES
GRINDERS
Tool • Twist Drill
GRINDING MACHINES
Hydraulic • Hydraulic Cylindrical
Jig • Optical • Universal
INDEX HEADS
Universal
JIG BORERS
JIG GRINDERS
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LATHES
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Toolmakers' • Turret & Repitition
MILLING MACHINES
Cam • Production • Surface • Toolmakers'
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Bench • Cam • Die • Heavy Duty
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TOOLS
Screw Machine-Carbide and High Speed Steel
TURNING MACHINES
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Millers Falls powerful versatile new No. 555 Impact Tool

Sleek, powerful, compact — this new No. 555 is the most remarkable, most versatile electric tool ever developed. Just try it. Once you see the amazing number of jobs it does — and the speed with which it does them — you'll agree that here is a tool with capabilities out of all proportion to its size.

When torque resistance is low, it drives at a continuous 1900 r.p.m. Then, when resistance rises, it automatically shifts to impact action. 2000 powerful blows per minute exert up to 100 ft. lbs. torque — ample to handle threaded parts as large as 5/8" diameter under favorable conditions.

With its rugged, powerful motor, it weighs only 6¾ lbs. It is easily controlled with one hand, quickly reversible, and built throughout for long, hard service. Write for full information, or better yet, let us arrange a demonstration. See for yourself how this heavy-duty, high-speed tool saves time and money on countless jobs.

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Standard 1/2-inch square drive — wide variety of accessories

- **Runs, sets, loosens and removes nuts and studs**
- **Taps and threads**
- **Extracts broken studs and bolts**
- **Drives screws**
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The Mark of Superiority

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Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Madison Mfg. Co., Muskegon Heights, Mich.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Porter-Cable Mch. Co., Salina St., Syracuse, New York.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Atlas Press Co., 1253 N. Pitcher Ave., Kalamazoo, Mich.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Landis Tool Co., Inc., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.

(Continued on page 342)

GROWING—
GROWING—
GROWING!



MORE AND MORE METAL-WORKING PLANTS ARE BUYING THE MATCHLESS PERFORMANCE OF

ELMES *Pipeless* HYDRAULIC PRESSES!

The demand for revolutionary Elmes *Pipeless* Hydraulic Presses is growing by leaps and bounds! All of Elmes' ultra-modern production facilities are being employed at peak efficiency to meet this unprecedented demand.

Why this sudden surge of orders? Because on-the-job performance has proved this new Elmes Pipeless design practically eliminates press downtime and reduces maintenance costs to an all-time low!

Elmes Pipeless design has put an end to high-pressure piping troubles. The main hydraulic circuit in these presses has no piping. All high-pressure fluid is conducted through short, direct passages drilled in the structural parts. There are no high-pressure screwed joints to loosen; no possibility of welded joints or fittings breaking or leaking oil.

Any Elmes Metal-Working Press, standard or special, can be supplied with pipeless construction—and at no premium. Why don't you get the facts on the savings that an Elmes Pipeless Press can make for your production? Call in an Elmes engineer now.



Photo shows an Elmes 125-Ton Pipeless Drawing and Forming Press, just completed. Another in background, under construction.

Write for your free copy of Elmes Bulletin No. 1011 giving detailed information on the Elmes Pipeless Press design.

American Steel Foundries

ELMES ENGINEERING DIVISION

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Dumore Co., 1300 17th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc. Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

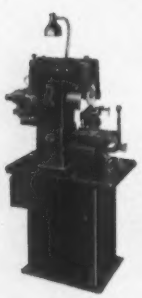
Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.

GRINDING MACHINES, Drill

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.



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Ask any user of the MORE THAN 6,000 HAMMOND CARBIDE TOOL GRINDERS now in service — "point by point" all the way through — these machines are precision built for efficient trouble-free grinding of CARBIDE AND HIGH SPEED STEEL TOOLS.

There's no substitute for experience, and Hammond has been building dependable machinery for 70 years!

Write for Catalog A-225

Model CB-77 Chip Breaker and Diamond Finishing Grinder for handling box and single point tools. (Model CB-77W for wet grinding also available).



Model WD-10 Wet or Dri 10" Carbide Tool Grinder with double cup wheel construction. (Available with straight and cup wheel also).



Model 14-WD Wet or Dri 14" Carbide Tool Grinder. Designed for production grinding of medium and large size tools. Will quickly pay for itself in longer tool life, wheel economy, and faster grinding.

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines.

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
British Industries Corp., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Walker, O. S., Co., Inc., Worcester, Mass
Waltham Machine Works, Newton St., Waltham, Mass.

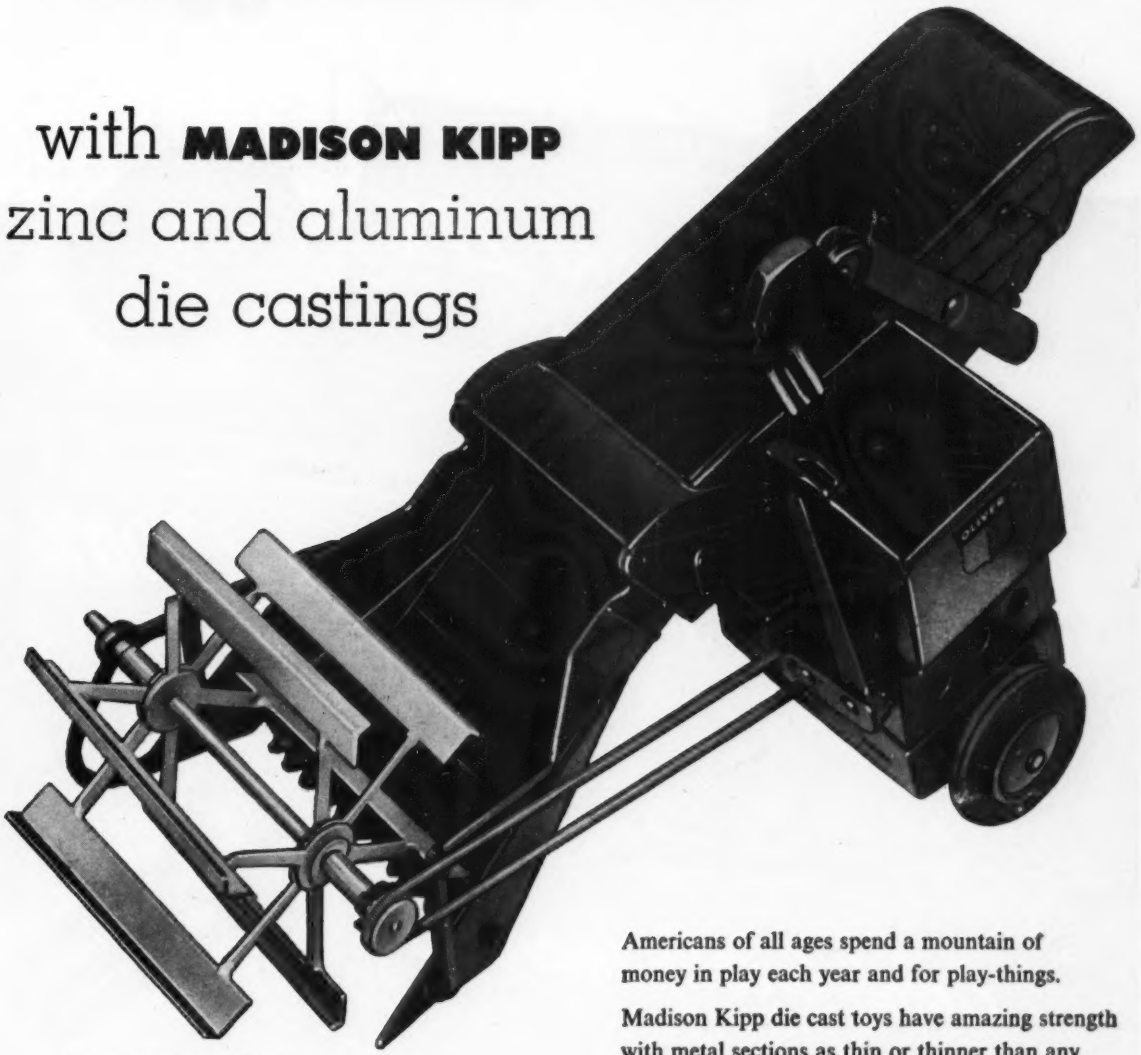
GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.

(Continued on page 346)

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with **MADISON KIPP** zinc and aluminum die castings



Kipp die castings made for Lansing Company Incorporated, Lansing, Iowa

Americans of all ages spend a mountain of money in play each year and for play-things.

Madison Kipp die cast toys have amazing strength with metal sections as thin or thinner than any other castings produced out of aluminum.

Designers of other commercial and ordnance products may find helpful hints from the engineers who design for the fun business.

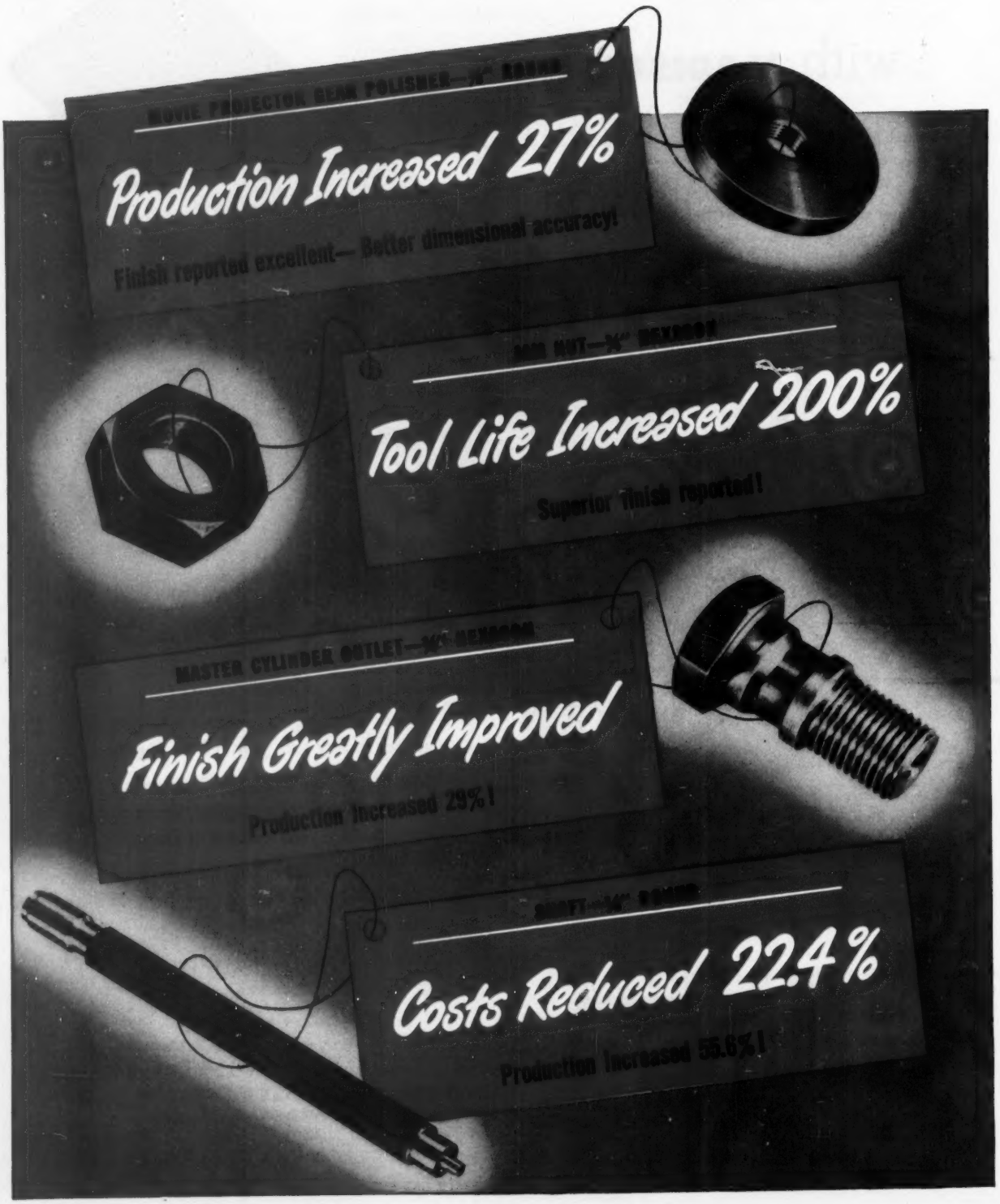
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• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

You can look ahead with confidence



to bigger output, lower costs

...when you do the job with MX

today's faster-cutting screw stock!

THIS is no news to the hundreds of shops that have switched from ordinary Bessemer screw stock to U·S·S Free-Machining MX. It may be news to you.

During the past few years, results obtained in producing over a billion screw machine parts of many different kinds have established these facts; 1) wherever you put fast-cutting MX to work, production goes up and costs come down; 2) you can safely figure that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock; 3) the more machine work your parts require the greater your savings will be.

Can you afford to ignore these well-proved benefits?

If you haven't tried MX on a production basis, now is a good time to start. Prove on your own machines that despite its slightly higher cost, MX is actually the most economical bar stock yet developed.

The reason is simple. U·S·S Free-Machining MX cuts cost in four ways. By increasing the rate of production, *it lowers the cost per part.* By prolonging tool life, *it reduces downtime.* By assuring better part finish it often *eliminates extra finishing operations.* By providing closer dimensional accuracy, *rejections are minimized.*

U·S·S Free-Machining MX is being produced in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form, MX is available direct through our nearest district sales office.

For more parts and better parts—at lower cost per part—standardize on MX.

UNITED STATES STEEL COMPANY, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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UNITED STATES STEEL

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
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Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Radial, Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Kelvin Systems Corp., 135 Front St., New York 5, N. Y.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
British Industries Corp., International Machinery Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gallmeyer & Livingston Co., 336 Straight Ave., S.W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Landis Tool Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 350)

NEW PROCUNIER TAPPERS

Work FASTER
Last LONGER
...and save Taps too!



Procunier Tapping Equipment is the answer to today's pressing need for tapping equipment that will meet current high-speed production demands and at the same time reduce maintenance and operating costs.

Developed by practical craftsmen—who have concentrated exclusively on developing, improving and perfecting tappers for more than 30 years—Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads **faster, for longer periods**—with fewer spoiled pieces, fewer rejects. Here's why:

1. **Tap breakage is practically eliminated** due to the high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch.
2. **Strain and wear are minimized** and torsion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation — **avoiding tap wobble.**
4. **Aluminum housings** assure greater strength and rigidity with minimum weight — a vital factor for high speed tapping.
5. PLUS many other exclusive features.

with the NEW "TRU-GRIP" Tap Holder

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

WRITE TODAY for more complete details and specifications on the complete line of Procunier Tapping Heads and see why Procunier offers the "finest in tapping equipment."

Procunier
SAFETY CHUCK CO.
16 SO. CLINTON ST. CHICAGO 6, ILL.

PROCUNIER SAFETY CHUCK CO.
16 S. Clinton Street
Chicago 6, Ill. Dept. 12

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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Address.....

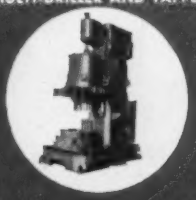
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Your "Hole" Future

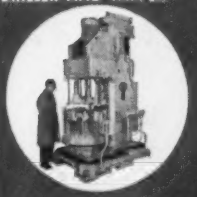
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ENGINEERED FOR QUALITY AND QUANTITY PRODUCTION

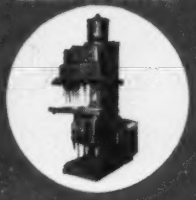
ADJUSTABLE SPINDLE MULTI-DRILLER AND TAPPER



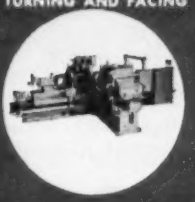
MEDIUM SIZED VERTICAL DRILLER AND TAPPER



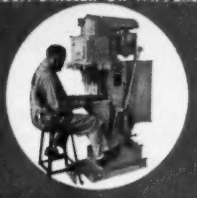
HIGH-SPEED MULTI-DRILLER OR TAPPERS



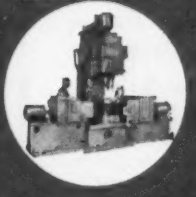
2-WAY BOREFACE FOR BORING, TURNING AND FACING



A-33 LIGHT SENSITIVE MULTI-DRILLER OR TAPPERS



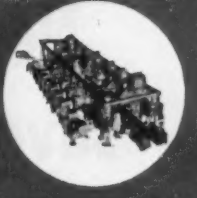
3-WAY HOLETAPPER WITH INDIVIDUAL LEAD SCREWS



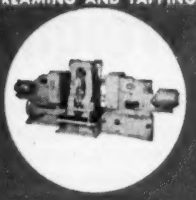
HOLESTEEL 2-WAY FLOOR TYPE FOR DRILLING AND TAPPING



HOLEWAY AUTOMATIC PROCESSING MACHINES



2-WAY HOLEUNIT FOR DRILLING, BORING, REAMING AND TAPPING



STATION TYPE MACHINES



Here are a few representative machines from the complete NATCO line . . . including a wide range from small, fast, light sensitive multi-drillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles . . . from 1/16 inch drill to 14 inch or larger bore. Materials worked include iron, steel, bronze, aluminum, plastic and wood. Call a NATCO Field Engineer.



Call a Natco Field Engineer

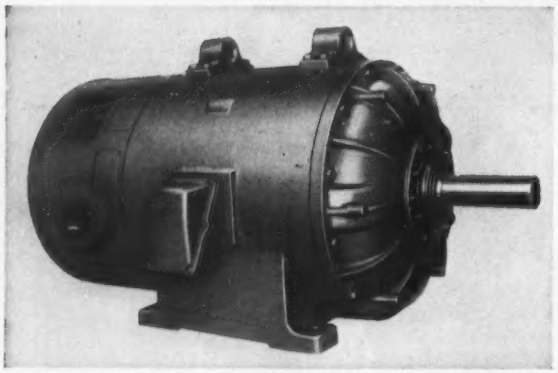
To help you solve your problems in Drilling, Tapping, Boring & Facing.

NATCO

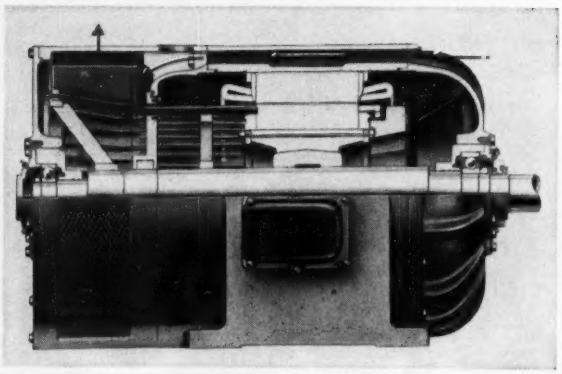
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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1907 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Designer's

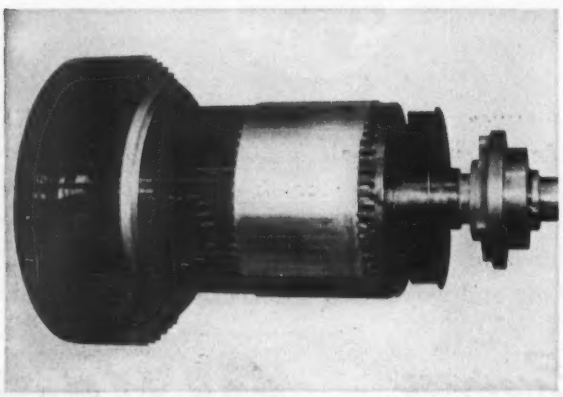


COMPACTLY BUILT, Type KRX motor has rigid cast-iron enclosure, integrally cast feet, diagonally split conduit box.



EXTENDED BARS OF ROTOR pass through rotating baffle plate to form radial fan. Arrows indicate the flow of cooling air.

New G-E enclosed high-slip motor saves up to 30% space, 40% weight



ROTOR HEAT is generated in high-resistance fan blades, outside of enclosure. Fan dissipates heat directly to cooling air.

Here's an important development for builders of punch presses, centrifuges, and other high-inertia-load machines. It's General Electric's new totally enclosed fan-cooled high-slip induction motor—the Tri-Clad* Type KRX. Incorporating a unique, efficient extended-bar rotor designed for improved heat transfer, it gives you:

Space savings up to 30 percent, compared to conventional high-slip motors. Frame sizes are the same as normal-slip enclosed motors of equal rating.

Up to 40 percent savings in weight, reducing your foundation and handling costs.

Lower operating costs, because improved cooling allows smaller air gap, improving electrical efficiency.

Extra motor protection against physical damage, electrical breakdown and operating wear and tear, because of famous Tri-Clad construction.

For more data, check Bulletin GEC-924.

*Reg. Trade-mark of General Electric Company.

GENERAL ELECTRIC

Digest

PRODUCT HIGHLIGHTS

EASY TO INSTALL ON YOUR MACHINES —COMPACT, VERSATILE LIMIT SWITCHES



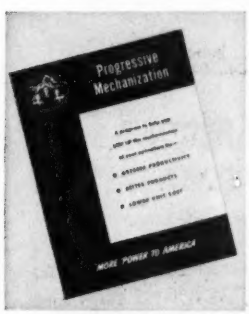
Does your machine design call for limit switches? Get the right type from General Electric. Versatile and compactly built, they're easily installed, adjusted, and maintained. Available are the lever type shown (Bulletin GEA-5705), rotating type (Bulletin GEA-5704), and track type (Bulletin GEA-5707).

EASILY SPECIFIED, QUICKLY INSTALLED —PACKAGED METALLIC-RECTIFIER UNITS

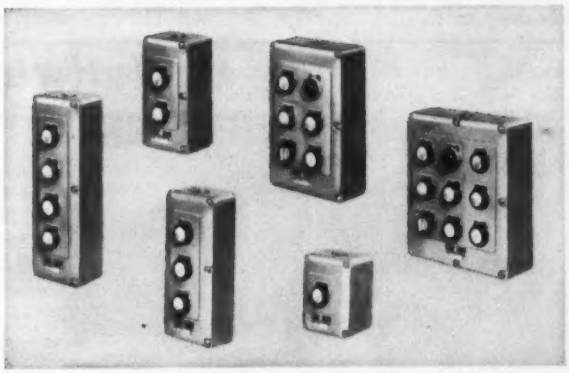
When a-c to d-c power conversion calls for metallic rectifiers, specify convenient packaged units from General Electric. Ordering is easy—each metal-enclosed unit comprises selenium rectifier stacks, insulated transformer, controls. No special foundation needed. Simple connections speed installation. See new Bulletin GEA-5658.



FOR YOUR LONG-RANGE MACHINE SALES —PROGRESSIVE MECHANIZATION PROGRAM



"Progressive Mechanization"—G.E.'s new More Power to America program—presents to industry a tested, step-by-step approach to greater mechanization. Addressed to *your* customers, it can be expected to boost your long-range machine sales. Program includes sound-color movie, "how-to" manual, and survey form. Details in Bulletin GEA-5789.



New push-button stations provide wide variety of unit combinations

An example of the design flexibility that marks General Electric's new oiltight push-button line is the variety of stations available. Specify any combination of units from one to nine, factory-mounted in one compact station, or order enclosures and units separately.

These surface-mounted enclosures accommodate the new line of G-E oiltight units with one basic type of contact block, interchangeable color rings, and a full line of interchangeable operators. Bulletin GEA-5779.

General Electric Company, Section B668-97
Schenectady 5, N. Y.

Please send me the following bulletins
√ for reference purposes
× in connection with immediate projects

- ☐ GEA-5658 Metallic-Rectifier Units
- ☐ GEA-5704 Rotating-Type Limit Switches
- ☐ GEA-5705 Lever-Type Limit Switches
- ☐ GEA-5707 Track-Type Limit Switches
- ☐ GEA-5779 Push-Button Stations
- ☐ GEA-5789 Progressive Mechanization
- ☐ GEC-924 Type KRX High-Slip Motors

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NAME .....
COMPANY .....
STREET .....
CITY ..... STATE .....

GRINDING WHEELS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati, Ohio.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill. (Diamond).
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HAMMERS, Steam

Chambersburg Engrg. Co., Chambersburg, Pa.

HARDENING EQUIPMENT

Lepel High Frequency Laboratories, Inc. (Induction), 55th St. and 37th Ave., Woodside 77, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDNESS TESTING INSTRUMENTS

Ames Precision Mch. Wks., Waltham, Mass.
Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 No. Madison, Rockford, Ill.

HEAT-TREATMENT OF METALS

Bennett Metal Treating Co., Elmwood, Conn.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS, Air

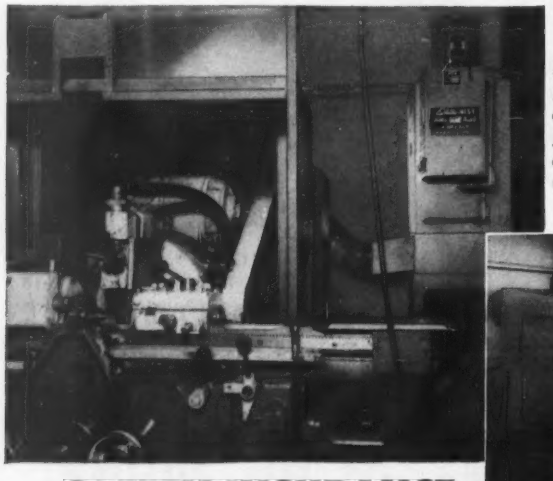
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.

HOISTS, Chain, Etc.

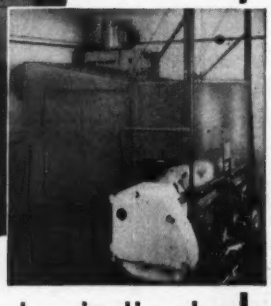
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(Continued on page 354)

today's best buy is better air!



Electro-Mist provides complete oil mist control for thread grinder at Lear, Inc., Grand Rapids



SAFETY INSURANCE
for high speed cutting and grinding!

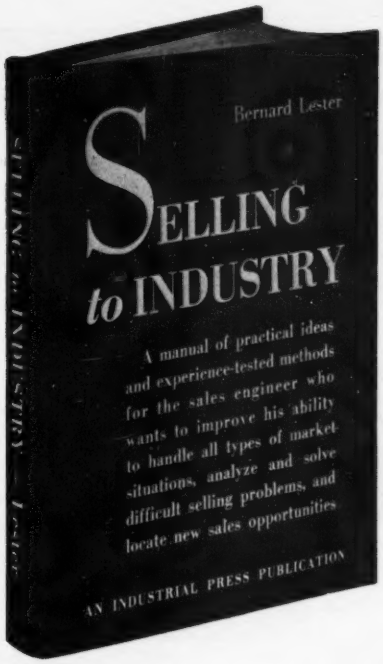
Electro-Mist unit collector eliminates oil mist and smoke at the source.

The hazards created by coolants and the nuisance of oil mist and smoke from high speed grinding and cutting operations are completely controlled by AAF's Electro-Mist collector. A self-contained unit designed specifically for this purpose, the Electro-Mist exhausts material at the source by combining heavy duty industrial filters with electronic precipitation. Its unique design allows easy removal of collector plate assemblies, as well as access to all parts . . . without tools . . . thus reducing maintenance time to a minimum.

The Electro-Mist also salvages as much as 2 to 5 gallons of coolant daily in its oil reservoir, which may be piped back into the machine or drained off, as desired. The above illustrations show how the plastic front of the hood may be raised for observation or adjustment, or when lowered, provides complete enclosure for the grinding or cutting operation.

If you are interested in safer, cleaner *high speed* grinding and cutting operations call your AAF representative today or write for complete details on Electro-Mist contained in AAF Engineering Bulletin No. 251.

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An Outstanding Authority on Sales Engineering Tells How You Can Increase Your Selling Ability

"Selling to Industry" is written specifically to help salesmen, sales engineers and sales managers who are engaged in selling industrial products or services. Written by Bernard Lester, sales executive, training director and consultant in the field of sales engineering, it discusses situations frequently encountered in selling, and presents solutions which have been found by experience to be most successful.

Throughout the book, the author uses brief "case histories" to illustrate his points, describes specific situations which he has encountered, and discusses methods of handling them. For example, he shows how to locate prospects . . . how to plan the sales interview to meet varying conditions . . . how to use sales aids effectively . . . how to overcome customers' objections . . . what should be done when orders "grow on trees" . . . how to follow up a sale to insure continued good will.

"Selling to Industry" is bound in handy pocket size, so that you can slip it easily into your pocket or brief case. In addition, the sales manager will find it a valuable desk book. He will use it frequently as a source of material and an idea stimulator for sales training courses, letters and bulletins, and sales meetings.

However favorable current conditions in your industry may be, you cannot afford to neglect the principles of good industrial salesmanship. "Selling to Industry" presents these basic principles in convenient form, so that they can be frequently reviewed and kept freshly in mind. It gives factual result-getting ideas that can be effectively applied in selling industrial machinery or equipment.

Everyone engaged in industrial selling, from sales manager to the newest recruit on the staff, should own a copy of "Selling to Industry." If you wish to see how this book can help you, mail the coupon below, and it will be sent postpaid at once. You may have the privilege of five days' free examination if you prefer.

"Selling to Industry" will help you . . .

1. **—size up your prospects—and find out what makes them tick.**
2. **—plan your campaigns—and see exactly what steps need to be taken.**
3. **—close more sales — and do it with a minimum of time and effort.**
4. **—analyze your mistakes—and use such experience to improve your selling ability.**
5. **—keep from sliding backwards — particularly in boom times when the going is easy.**
6. **—establish a solid basis of achievement —and lay the foundation for a successful sales engineering career.**

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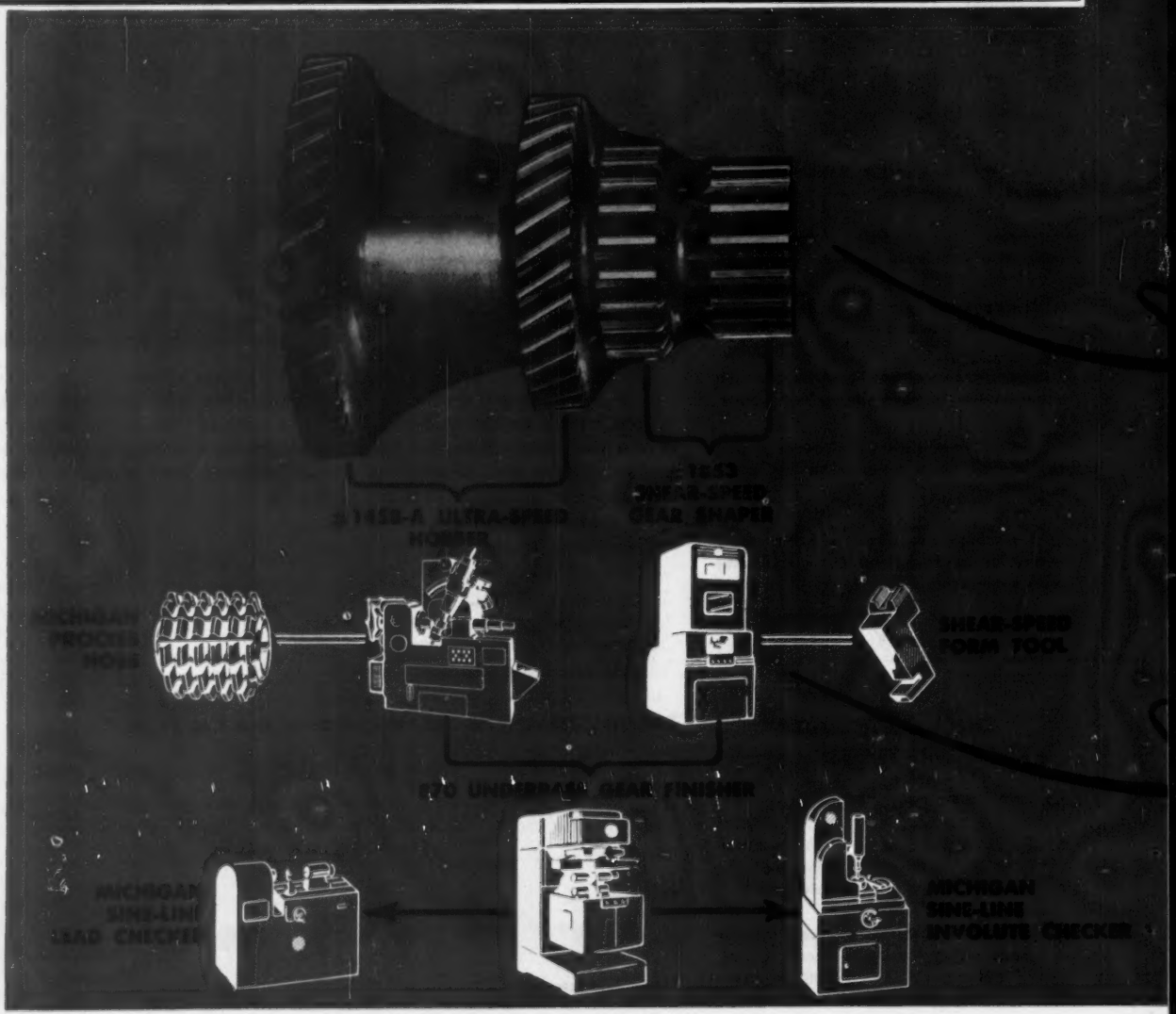
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81 seconds	67 seconds	38 seconds	48 seconds	Estimated cutting time	**cutting**
32/hr.	37/hr.	56/hr.	48/hr.	Gears / hr. at 85% eff. per machine	
60 seconds	50 seconds	48 seconds	45 seconds	Estimated cutting time	**finishing**
41/hr.	47/hr.	48/hr.	51/hr.	Gears / hr. at 85% eff. per machine	



YOU CAN GET PRODUCTION LIKE THIS

ON GEARS LIKE THESE

TOOLED WITH THESE MACHINES

THE TIME TO PLAN YOUR GEAR PRODUCTION....

The best gears are produced at the lowest cost when (a) each production step is tooled for maximum efficiency and (b) all steps of the line are properly "coordinated"—from blank to finished gear.

That is where Michigan Tool Company comes in.

That is why we have developed so complete a line of gear production equipment—machines and tools for practically every step, including gear cutting, finishing and control of quality.

We would like to help you improve your "line coordination," help you cut costs and rejects, increase output per machine and man hour, improve quality.

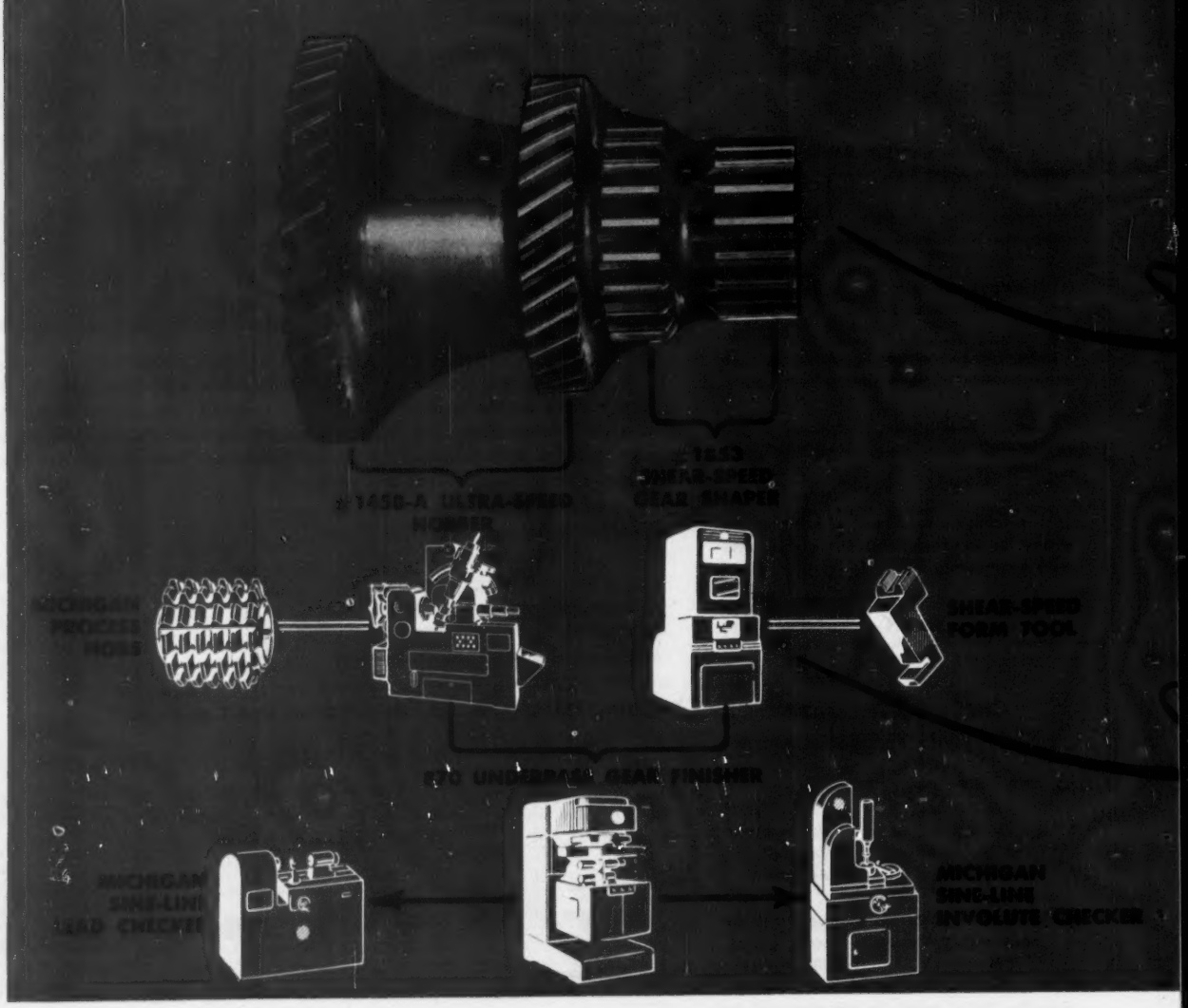
An invitation from you to have one of our engineers visit your plant and discuss your plans and problems with you will be appreciated.

May we hear from you?

MICHIGAN TOOL Company

COMPLETE from blank to finished gear

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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.

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Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

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Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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Wilson, K. R., 215 Main St., Buffalo, N. Y.

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...AN AUTOMATIC ASSEMBLY OF STUD, SPRING AND SLEEVE

PRODUCTION: This Bodine No. 40-10 Dial Type automatic assembly machine produces 1500 completed parts per 50 minute hour at 30 strokes per minute. One operator can attend several machines. Top view shows tooling with 3 Syntron type hoppers to feed stud, spring and sleeve. Tolerance held to overall height of ±.008. Our engineers provide an overall service to solve your specific problems with Bodine automatics and tooling for drilling, milling, tapping, screw insertion and assembly.





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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
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(Continued on page 358)



*Trade Mark.

At Right: MAGNI-FORM Dresser mounted on magnetic chuck for short run jobs. Below: Permanent mounting on machine table.



Made In 3 Types

1. Universal Contour Wheel Dresser—for all types of horizontal spindle surface grinders with 1" and 2" wide wheels. Manually Operated.

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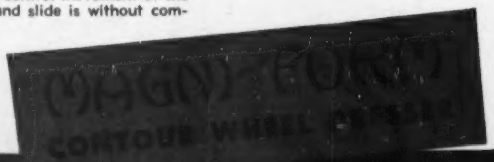
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PRODUCTION: This Bodine No. 40-10 Dial Type automatic assembly machine produces 1500 completed parts per 50 minute hour at 30 strokes per minute. One operator can attend several machines. Top view shows tooling with 3 Syntron type hoppers to feed stud, spring and sleeve. Tolerance held to overall height of ±.008. Our engineers provide an overall service to solve your specific problems with Bodine automatics and tooling for drilling, milling, tapping, screw insertion and assembly.

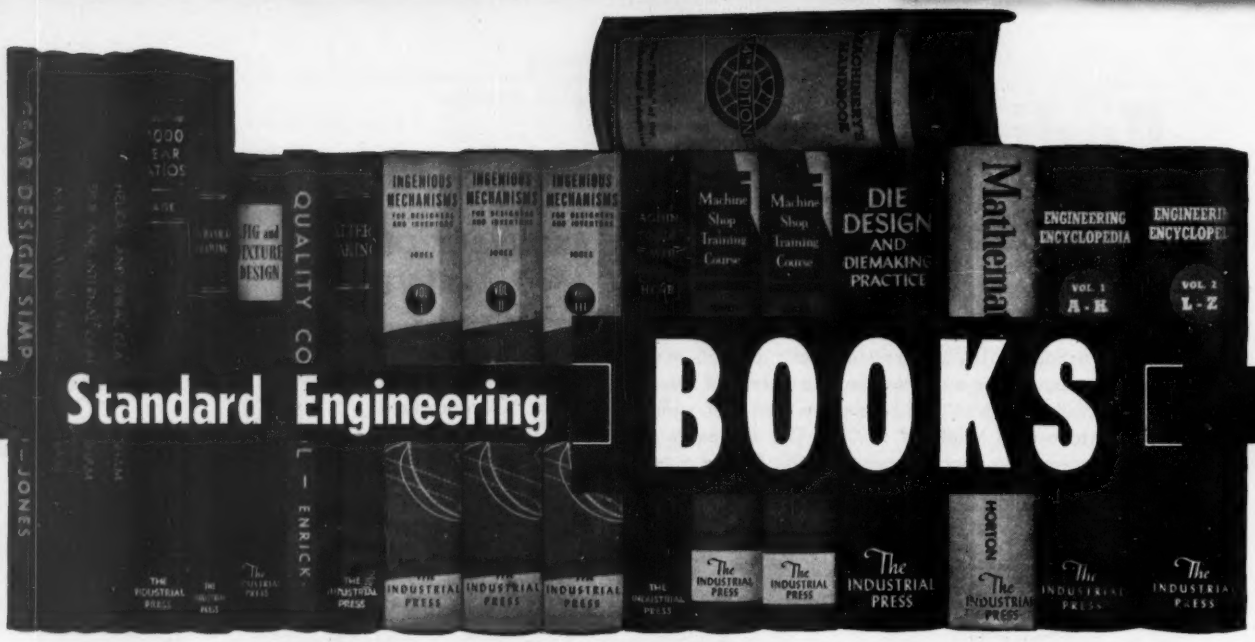


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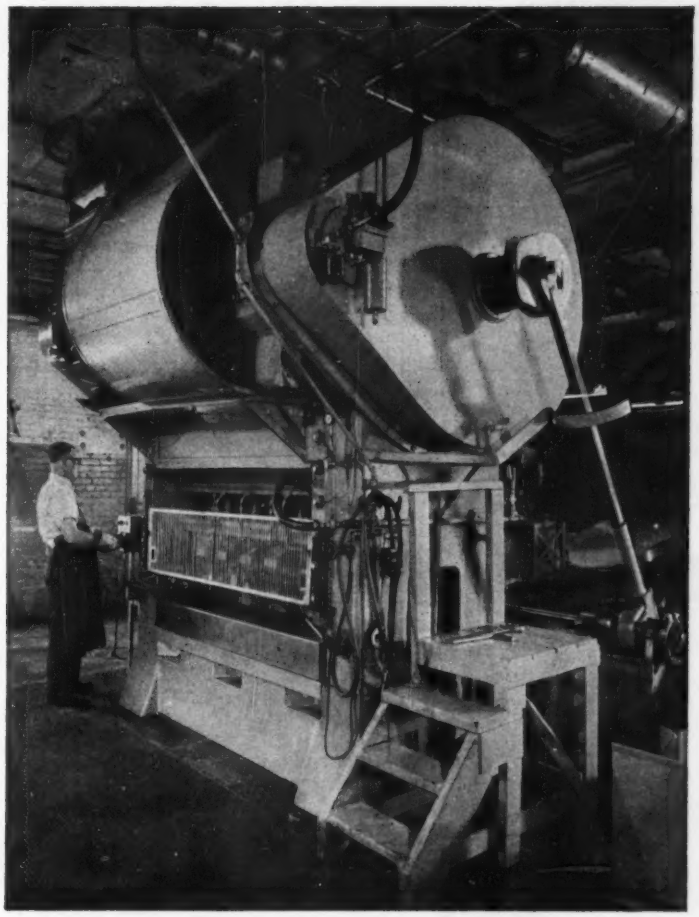
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(Continued on page 360)



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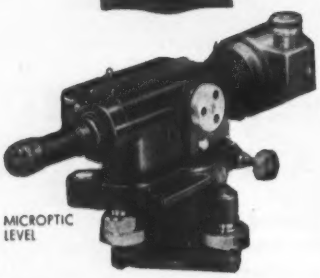
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Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

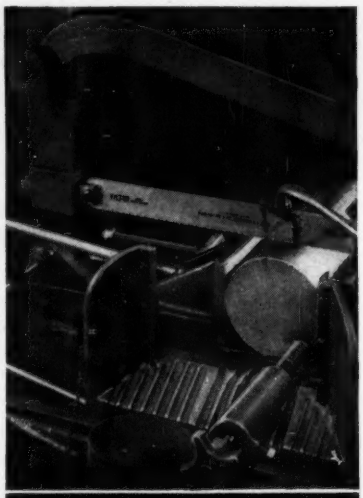
LATHES, Duplicating

H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Pork Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Monarch Machine Tool Co., 27 Oak St., Sidney Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.

(Continued on page 364)



EFFICIENT CUTTING... LONG BLADE LIFE...
plus at least
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VICTOR "Moly"® High Speed Power Blades

Do your toughest metal cutting jobs efficiently, economically and *right* with VICTOR "Moly" High Speed Power Blades.

To begin with, you'll reduce your initial blade cost by 15%. From then on, you'll find additional savings in better cutting and longer blade life. Quality steel, carefully heat treated, fabricated on special machinery, has made VICTOR Blades industry's preferred blades for over half a century. And your Industrial Distributor will give you free copies of the VICTOR Metal Cutting Booklet which tells you what blade to use for every job, Ask him for it.

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R-B INTERCHANGEABLE PUNCHES AND DIES

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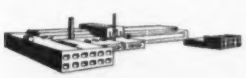
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ALLIED PRODUCTS CORPORATION

DEPT. D-9 • 12619 BURT ROAD • DETROIT 23, MICH.



PLANT 1
Detroit, Mich.



PLANT 2
Detroit, Mich.



PLANT 3
Hillsdale, Mich.

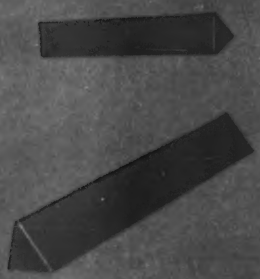


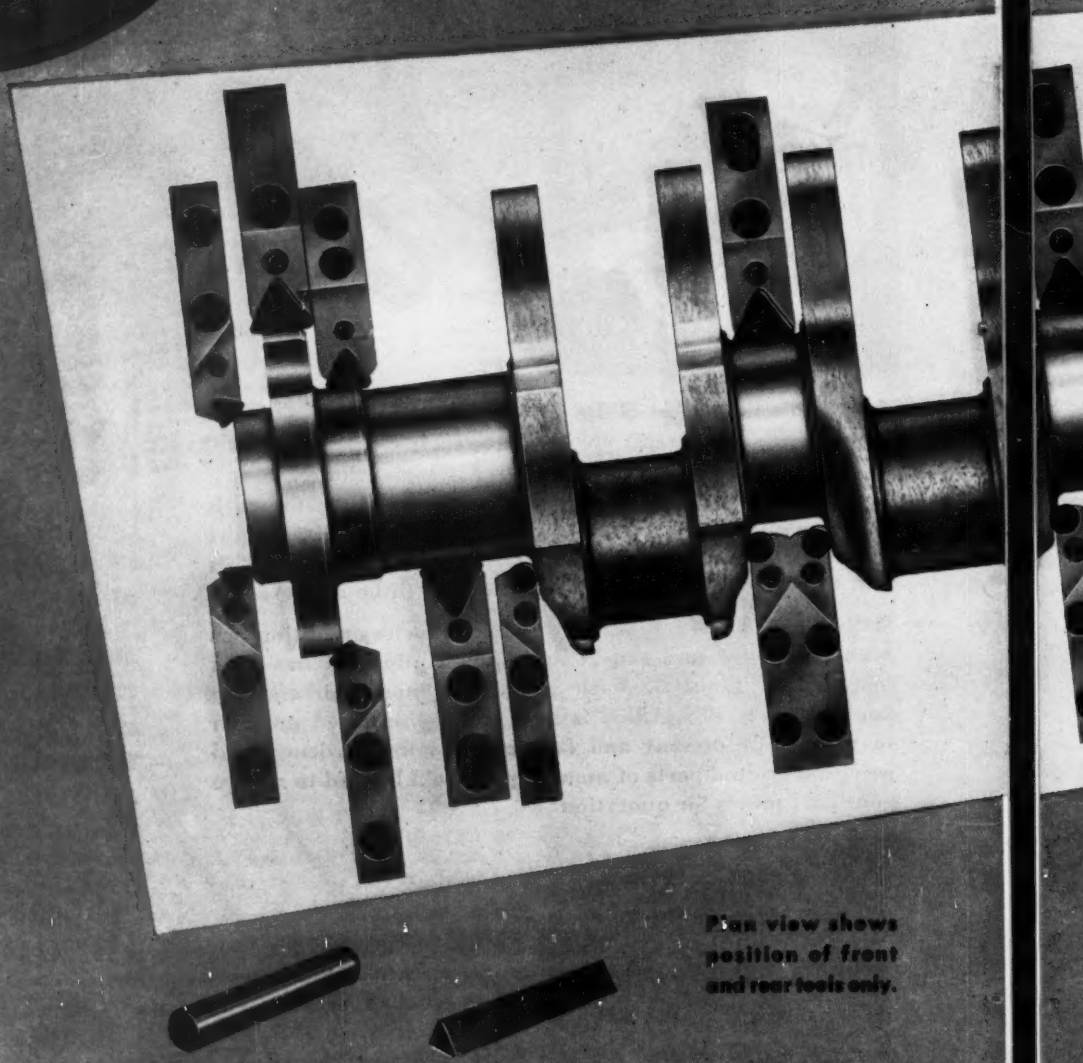
PLANT 4
Hillsdale, Mich.

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WESSON TOOL HOLDERS

First.





Wessonmetal—the cemented carbide giving users phenomenal performance throughout industry—turns to new successes on this difficult crankshaft turning job. Look at the production increase, the increase in pieces per tool change, the long, more efficient tool life possible with Wessonmetal.

Plan view shows position of front and rear tools only.

WESSONMETAL

WESSON METAL CORPORATION
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TO TURN CRANKSHAFTS

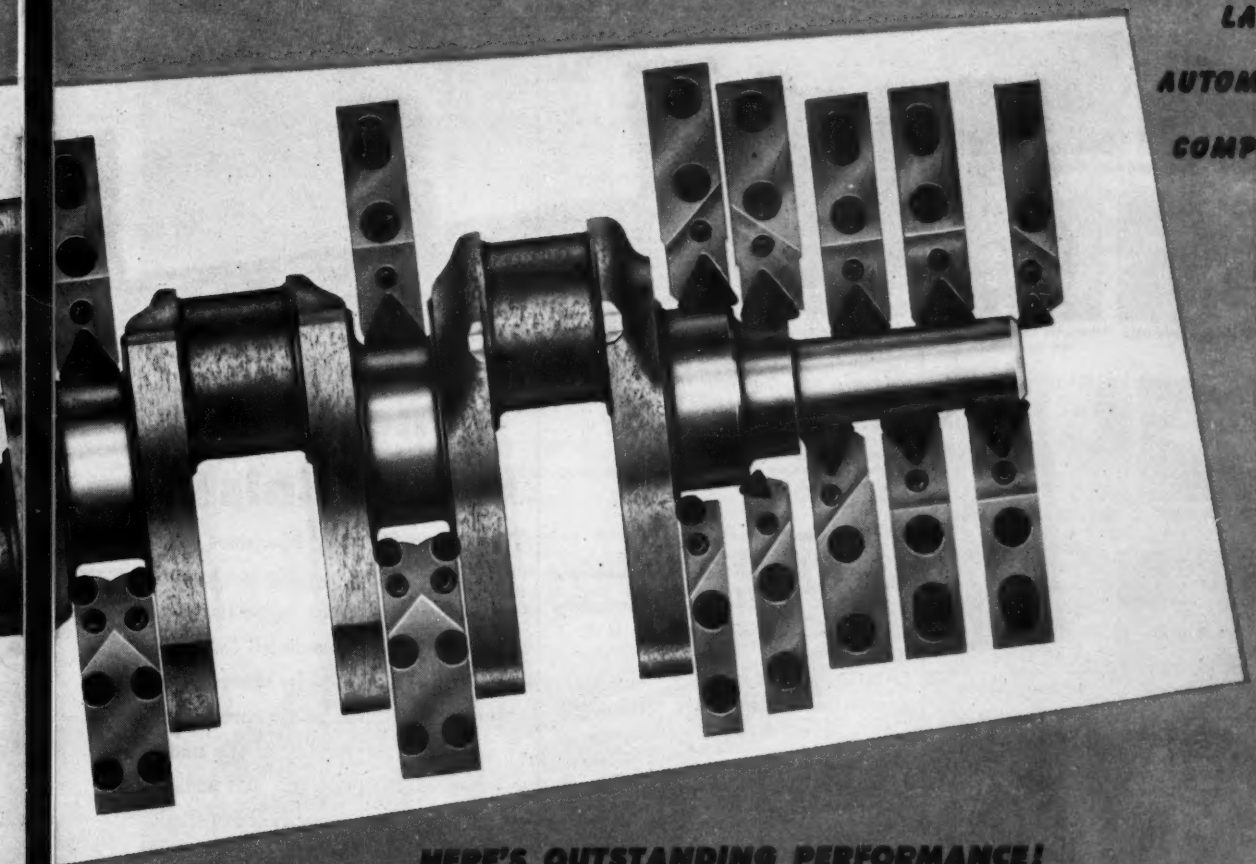
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and WESSONMETAL SOLID CARBIDE INSERTS

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NOW RUNNING AT ONE OF THE LARGEST AUTOMOTIVE COMPANIES



HERE'S OUTSTANDING PERFORMANCE!

AN AVERAGE OF 9000 PIECES PER INSERT BEFORE SHARPENING

OLD METHOD	
Pieces	11 per hour
Cycle Time	1 min. 55 seconds
Cranks per tool change (average)	1.7 pieces

NEW WESSON METHOD	
Pieces	48 pieces per hour
Cycle Time	40 seconds
Cranks per tool change (average)	1500 pieces

WRITE FOR *Complete Story* with DRAWINGS

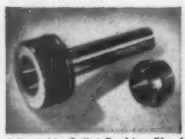
WESSON COMPANY

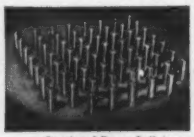
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SOUTH BEND LATHE
ATTACHMENTS
• Increase Lathe Versatility
• Simplify Difficult Jobs
• Perform Special Classes of Work


Handlever Collet Attachment

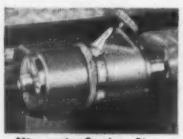

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Adjustable Collet Bushing Chuck


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Safety and Standard Lathe Dogs


Telescoping Jaw Follower Rest and Center Rest


Micrometer Carriage Stop


Handwheel Collet Attachment


Milling Attachment


Ball Bearing Live Center


10 in 1 Tool Holder


Thread Dial Indicator


External Grinder


Centers, Drill Pads

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
Hendey Machine Co., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St, Cleveland 13, Ohio.

(Continued on page 366)



need a better finish?

Torrington Swaging Machines – delivering 4000 hammer blows a minute – work out surface imperfections quickly... produce a finish far superior to that obtained by other reduction methods. Swaging improves the quality of the material, too, and utilizes every ounce of stock.



"The Torrington Swaging Machine" describes all the advantages of swaging and gives full details on all Torrington machines. A copy is yours for the asking.

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Swager Department
558 Field Street • Torrington, Conn.
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TORRINGTON NEEDLE BEARINGS

Most ECONOMICAL *Installation*

for RIFLE-BROACHING 20 MM GUN BARRELS

with production requirements up to 12 barrels per hour!



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H P RIFLE BROACHING MACHINE

Large coolant reservoir

Magnetic filters

Sufficient pressure range (up to 1200 pounds)

Built with a fully automatic **high pressure** coolant system, this LAPOINTE-engineered HP type BROACHING MACHINE provides the **best possible surface finish** . . . and with one-man operation!

This machine is easy to load and unload, and economical to operate because it is practically automatic. Interlocking controls prevent malfunctioning. Versatile cutting speeds, ranging up to 30 fpm.

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Close-up view of Lapointe-designed fixtures, broaches, gun barrel, and non-ferrous tube for automatic broach return. Each broach has a pilot section, to follow previous cut.



THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

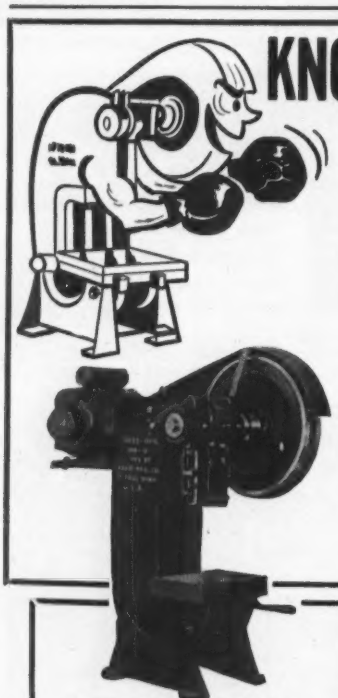
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Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp, 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc. (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Murad Developments Ltd., Aylesbury, Bucks, England.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lehmann, J. M., Co., Inc., 55 New York Ave., Lyndhurst, N. J.
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Sinclair Refining Co., 630 5th Ave., New York, N. Y.
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Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
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Norma-Hoffmann Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

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METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.

(Continued on page 368)

They're TUNGSTEN CARBIDE



They're PRECISION GROUND-FROM-THE-SOLID

Quality Engineered

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AND OTHERS BY ATRAX

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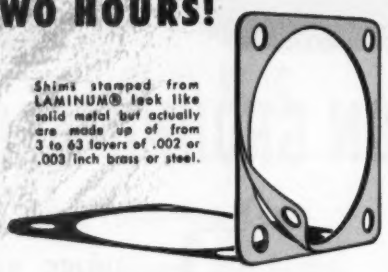
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NEWINGTON IN CONNECTICUT



2 Seconds

CAN SAVE YOU TWO HOURS!



Shims stamped from LAMINUM® look like solid metal but actually are made up of from 3 to 63 layers of .002 or .003 inch brass or steel.

Adjusting bevel gear mesh with a laminated shim is a matter of two seconds to remove a lamination!

The shim in this case is made of LAMINUM®, our exclusive material. It is a "solid" unit built up of 16 layers of .002 brass. It peels quickly and easily. Each shim removed adjusts the bevel gear position by two thousandths.

You save time by easier machining tolerances on the housing; ***you save time*** by eliminating pesky assembly machining; ***you save*** by not tying up a machine intermittently. IT'S EASIER!

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SHIM HEADQUARTERS SINCE 1913

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Neise, Karl, A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

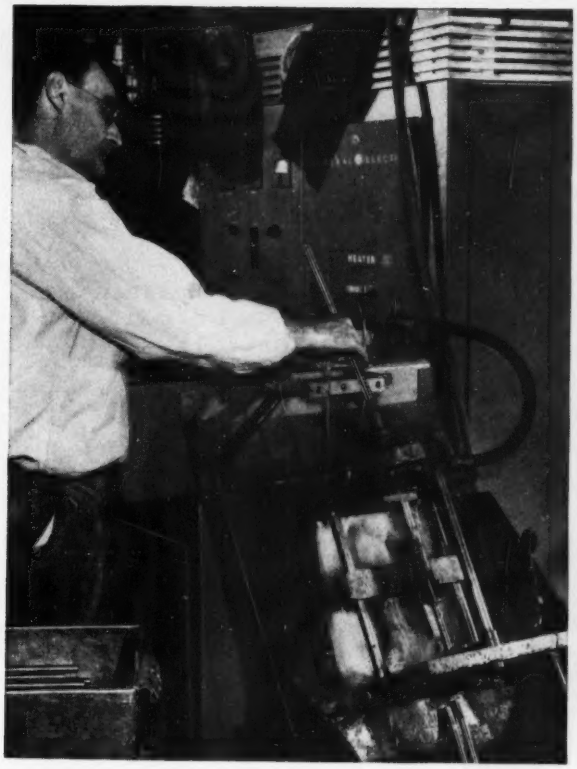
MILLING MACHINES, Circular Continuous

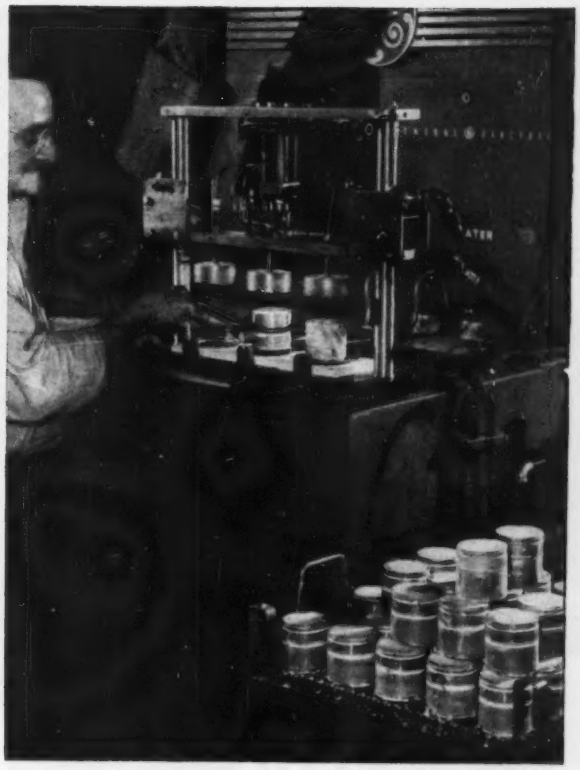
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.

(Continued on page 370)





1600 basket shafts are hardened on this machine in an eight-hour shift . . . while this heater silver-solders high-strength joints, three to a cycle.

"VERSATILE G-E INDUCTION HEATERS CUT COSTS 48%" SAYS EASY WASHER

SYRACUSE PLANT SAVES TIME, LABOR, MONEY WITH INDUCTION HEAT

"We cut the entire cost of hardening basket shafts from $.13 each to $.0675 each," says Mr. Victor Barden, General Foreman of the Heat-treat Department at Easy Washing Machine Company. Formerly done by a cyanide process, this operation required three shifts of two men each to harden 1600 shafts. Now, with one G-E induction heater, one man can harden 1600 shafts in an eight-hour shift, releasing five skilled men for other work.

Better hardness characteristics are shown by samples tested after induction heating and quenching. Exact automatic control of heating and quenching times gives uniform hardness to every shaft. In four years of use, the only maintenance cost has been for replacing two electronic tubes.

Versatile G-E induction heaters at Easy are also used for soldering, brazing, and annealing with comparable results. Says Mr. F. L. Taylor, Factory Manager, "We are very pleased with these heaters because they enable us to improve quality and reduce costs on many washer components."

Selective heating for annealing, brazing, soldering and hardening can be done faster and at lower cost by putting G-E induction heaters to work in your plant. For more information, just contact the G-E Sales Office nearest you, or clip the coupon below. *General Electric Co., Schenectady, N. Y.*

Sec. K 720-83, General Electric Co., Schenectady 5, N. Y.

Please send me a copy of Bulletin GEA-4945, "Induction Heating in Industry."

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☐ for immediate project

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Company.....

Street.....

City.....

State.....

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Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 50 Church St., New York, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Marac Mchry. Corp., 1819 Broadway, New York, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machine, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Marac Mchry. Co., 1819 Broadway, New York N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

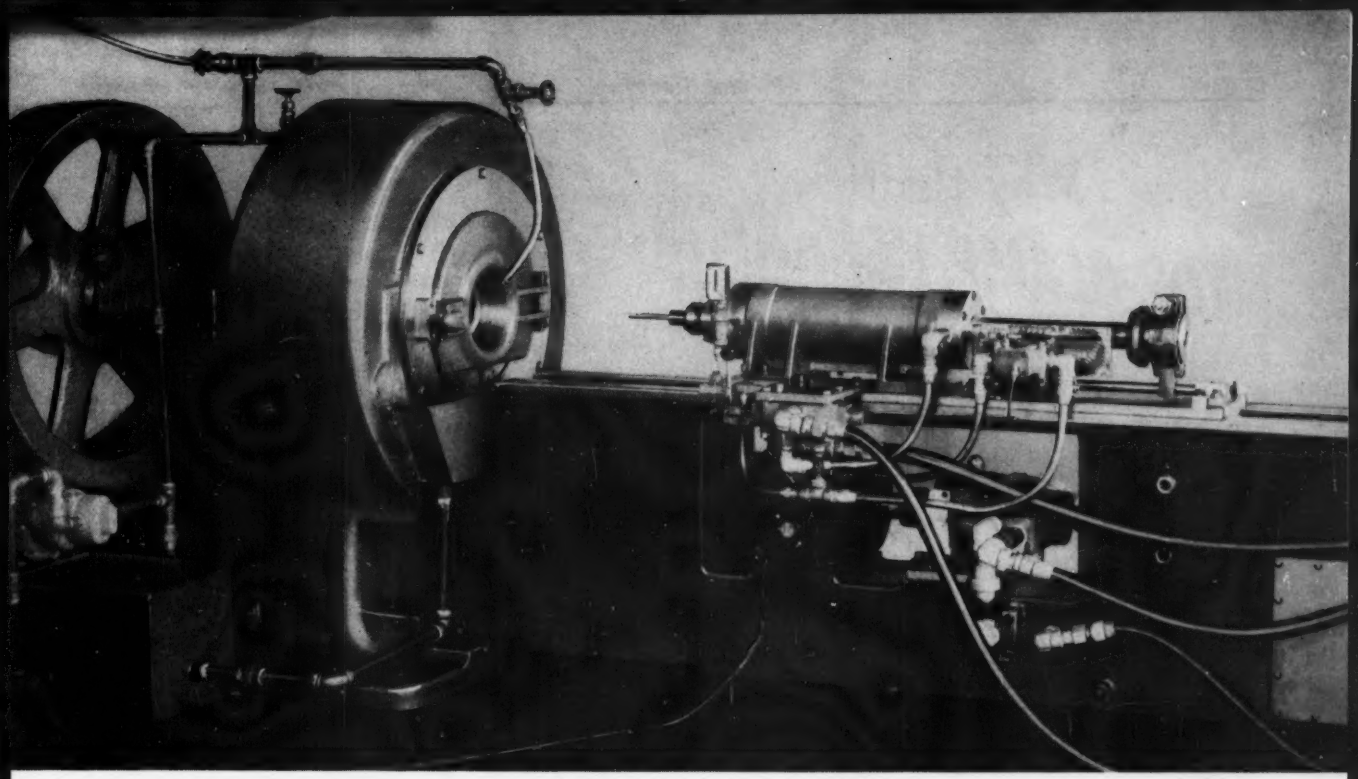
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

(Continued on page 372)





FENN SWAGING MACHINE, featuring hydraulic feed, automatic chucking, and oil-cooled dies, is fast replacing lathes and screw machines for shaping a wide range of metal parts because it . . .

MAKES METAL GO TWICE AS FAR

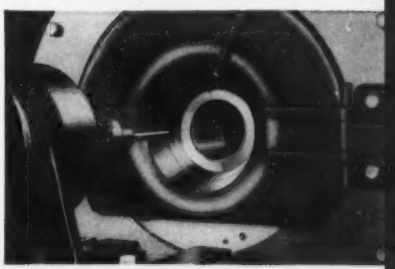
Yes, you can cut your metal requirements in half, in many cases, with this Fenn Swaging Machine. That's because it doubles the length of the blanks it shapes . . . with absolutely no stock removal.

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What's more, this Fenn Swager produces a denser structure in metal parts . . . maintains concentricity . . . gives an improved finish . . . requiring no subsequent grinding . . . calls for less operator skill than any other machine capable of producing equivalent parts.

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It will pay you to investigate all the cost-cutting, material-saving advantages of the Fenn Swager. Contact the Fenn distributor nearest you for facts and delivery schedules, or write direct to THE FENN MANUFACTURING COMPANY, 1857 Broad St., Hartford 1, Conn.



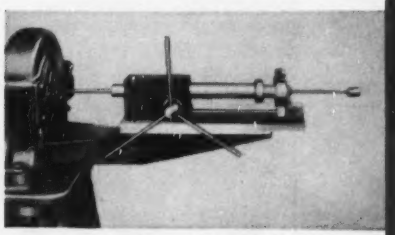
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FENN FEEDING DEVICES, either manually or hydraulically operated, are available for all sizes of swagers. They speed up production and reduce operator fatigue.

Here's Why the New
TOP-CLAMP KENNAMATICS
Give Top Performance

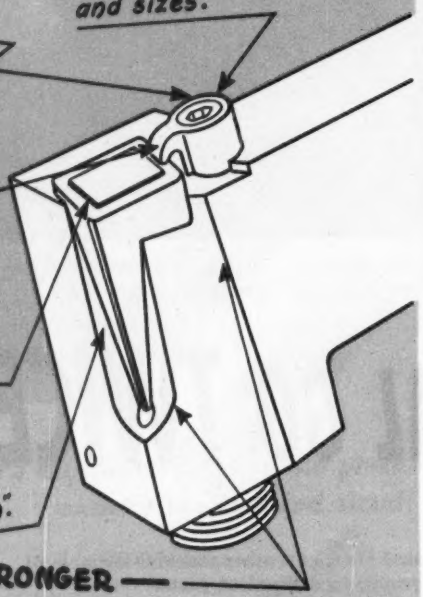
EASY TO GET AT— double end socket type screw permits release of clamp from either top or bottom.

SIMPLIFIED DESIGN— one rugged clamp and one sturdy screw for all standard tool styles and sizes.

EASIER TO INDEX— simply loosen clamping screw and clamp is up and away from insert.

CHIP BREAKER — most types can be used on insert without interference with clamp.

OPEN FRONT — provides added clearance and eliminates shank abrasion from "chip wash".

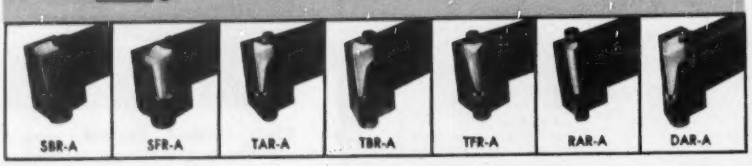


STRONGER — design provides greater rigidity. Insert is solidly backed up in direction of cutting force.

ALL Proved KENNAMATIC Features Retained!

- Indexable insert—positioned vertically—makes best use of Kennametal's high compressive strength.
- Simplified tool setting—insert has several cutting edges on both ends; can be revolved, turned end over end, or replaced without changing tool setting.
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Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

MOLYBDENUM

Climax Molybdenum Co., 500 5th Ave., New York, N. Y.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Coin.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co. Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-Locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
De Laval Separator Co., Poughkeepsie, N. Y.

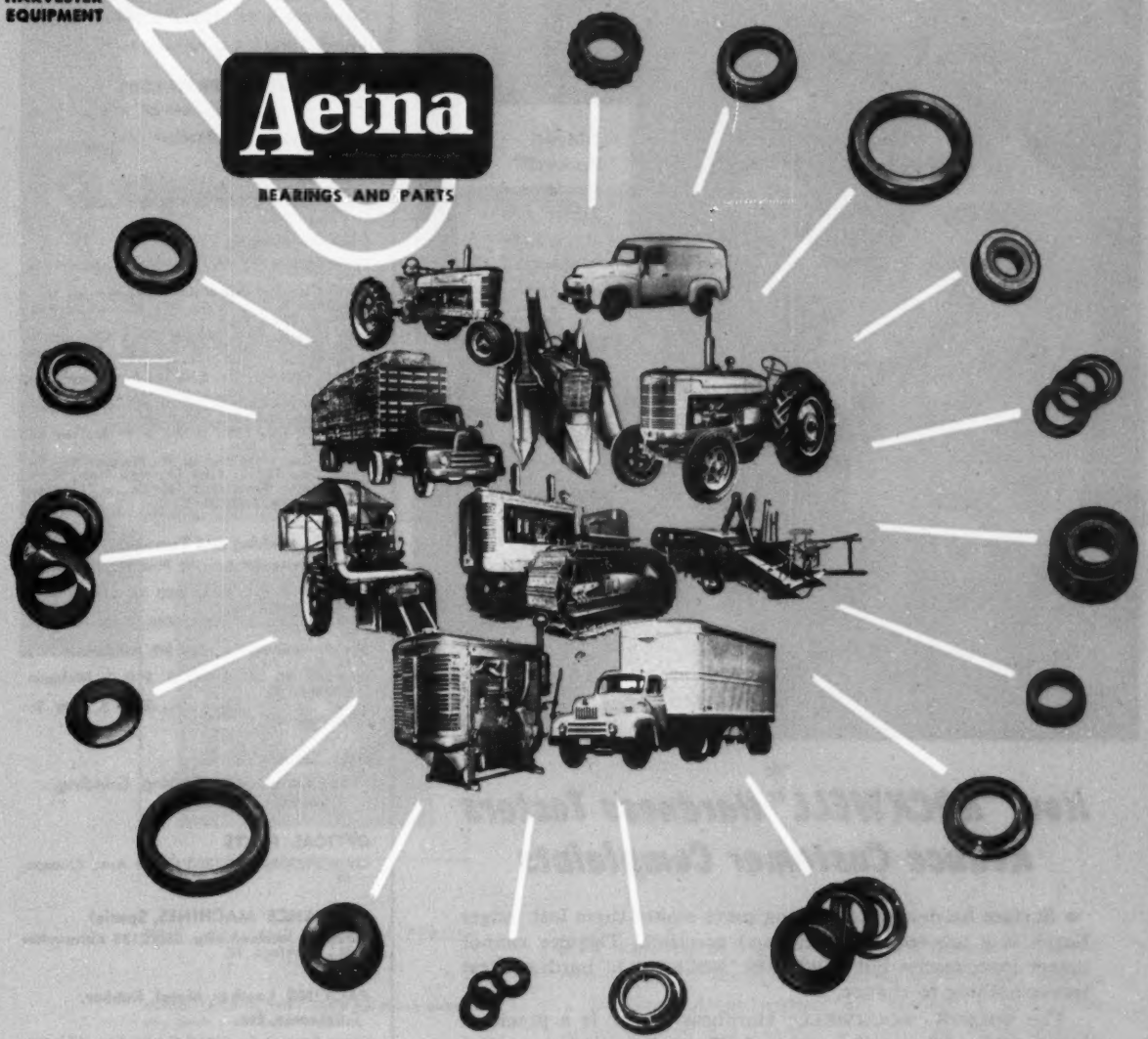
(Continued on page 374)

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IN STEADY COMPANY FOR 27 YEARS

Aetna

BEARINGS AND PARTS

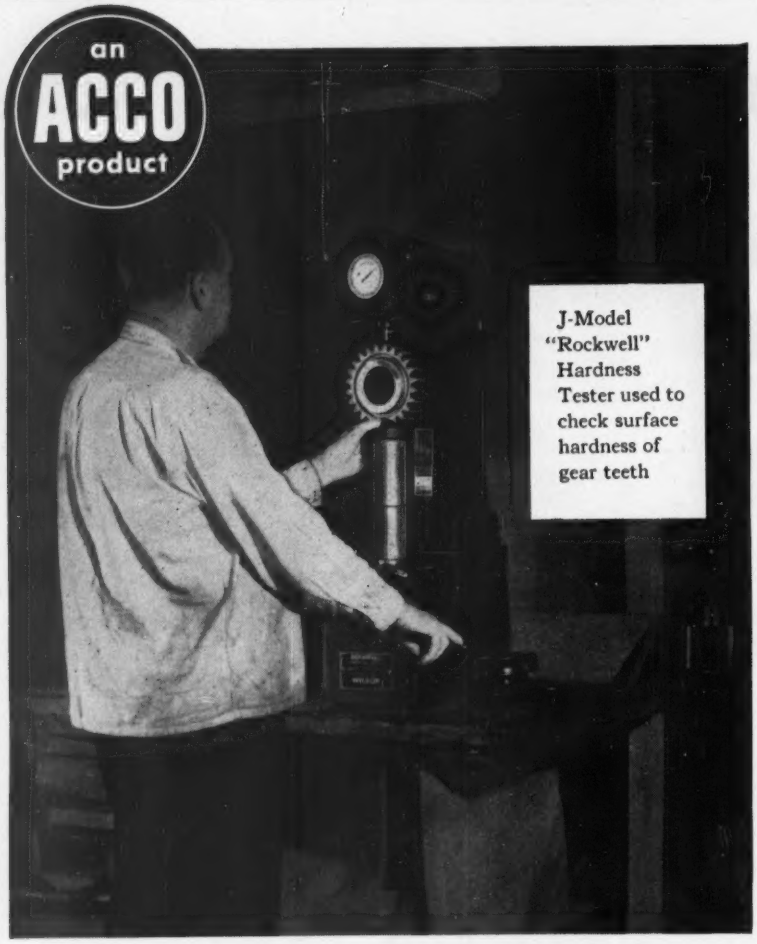


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Madison-Kipp Corp., Madison, Wis.

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Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
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Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal
Mummert-Dixon Co., Hanover, Pa.

PHOSPHOR BRONZE—See Bronze.

PILLOW BLOCKS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

(Continued on page 376)



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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
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Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Bethlehem Steel Co., Bethlehem, Pa.
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Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

(Continued on page 378)



9 design problems that can be met with the... Allenut

Ever-increasing applications for the new ALLENUT have caused sales to double within the past two years. Here are some of the things it can do to aid your product designing:



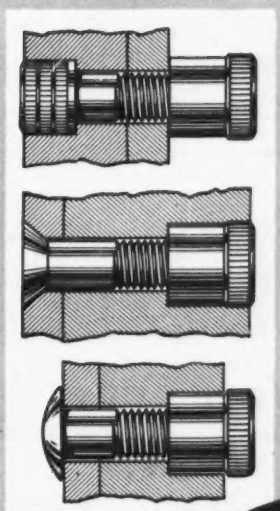
1. Self-anchoring in any metal. Allenut provides positive anchoring action through its hardened knurls.

2. Compact design. Requires no space for box wrenching. 12-point socket permits tightening in awkward places.

3. Smooth surfaces. Fits flush or below surface in counterbored hole . . . . permits streamlined, safe surfaces.

4. A ready-made, hardened, tapped hole. When used as a bushing, prevents costly stripping of threads caused by frequent removal and replacement of screw or bolt. In castings and other soft metals a stripped hole can be counterbored, an Allenut inserted and the same bolt or screw used.

5. Tighter fit. Greater thread contact than with ordinary nuts because of Class 3 fit. Weld-like setups accomplished with one hand wrenching. Allenut holds firm against turn of screw.



6. Usable with any type of bolt or screw. Permits space-saving, internal wrenching of cap screws, T bolts, machine bolts, and other common fasteners.

7. Saves parts. No washers required when anchored.

8. Easier to use. Knurled ring facilitates fingering-in. Allenut is always square to counterbored hole. Removable by hitting screw or bolt head with tap of a hammer.

9. Reusable indefinitely. Anchoring action remains unimpaired. Hardened threads and socket stand up under repeated removal and replacement.





Allenuts are available in a full range of 14 standard sizes from no. 4 to 1" from leading industrial distributors.

We welcome your inquiry and request for engineering details on Allenut applications.



Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Gardner Machine Co. (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Jarvis, Charles L., Co., Middletown, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads.

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Columbia Mchry. & Engrg. Co., Hamilton 1, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.

(Continued on page 380)



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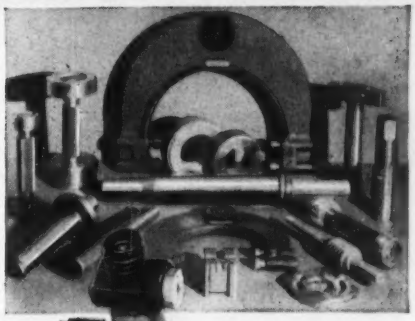
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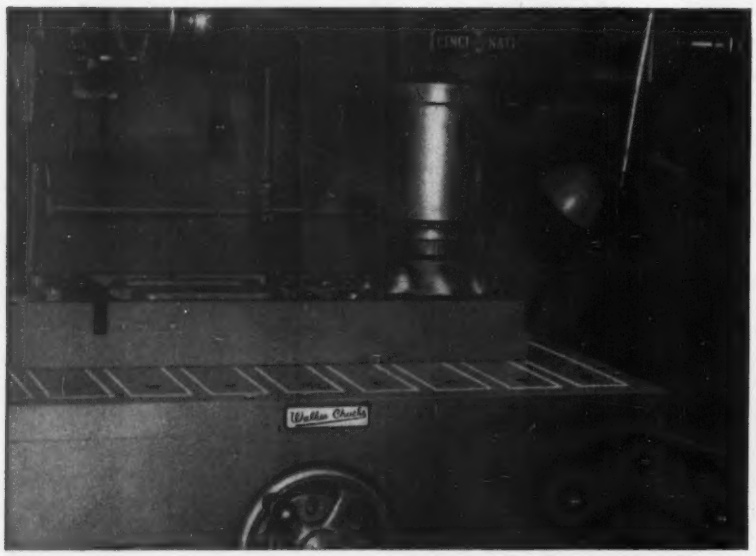
100 East 42nd Street NEW YORK 17, N.Y.

Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Ave., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.

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V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc., (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Pull-Gear Co., 21125 Dequindre St., Hazel Park, Mich.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

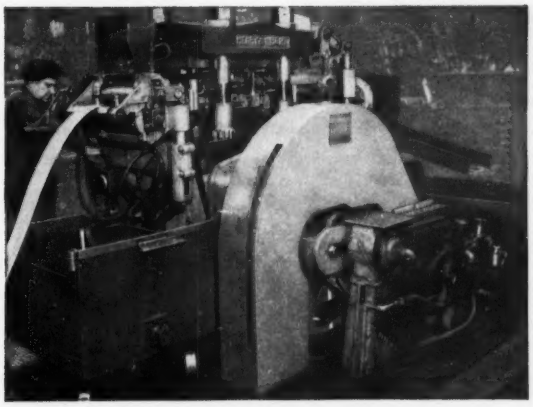
Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

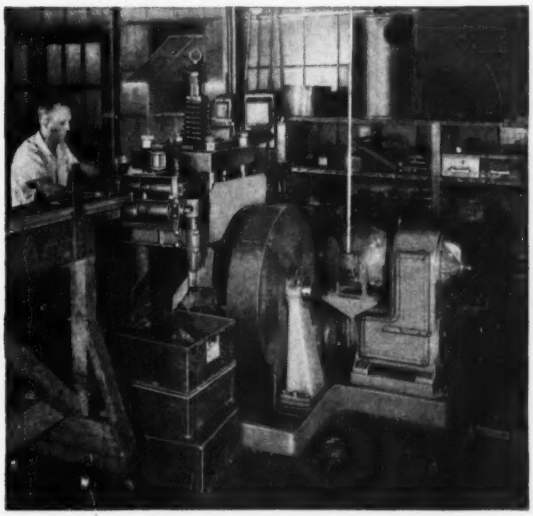
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.

(Continued on page 382)

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Viking Pump Co., Cedar Falls, Iowa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Vacuum

Leiman, Inc., 156 Christie St., Newark, N. J.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

PYROMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

RACKS, Gear Cut

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Keo Cutter, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Madison Mfg. Co., Muskegon Heights, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

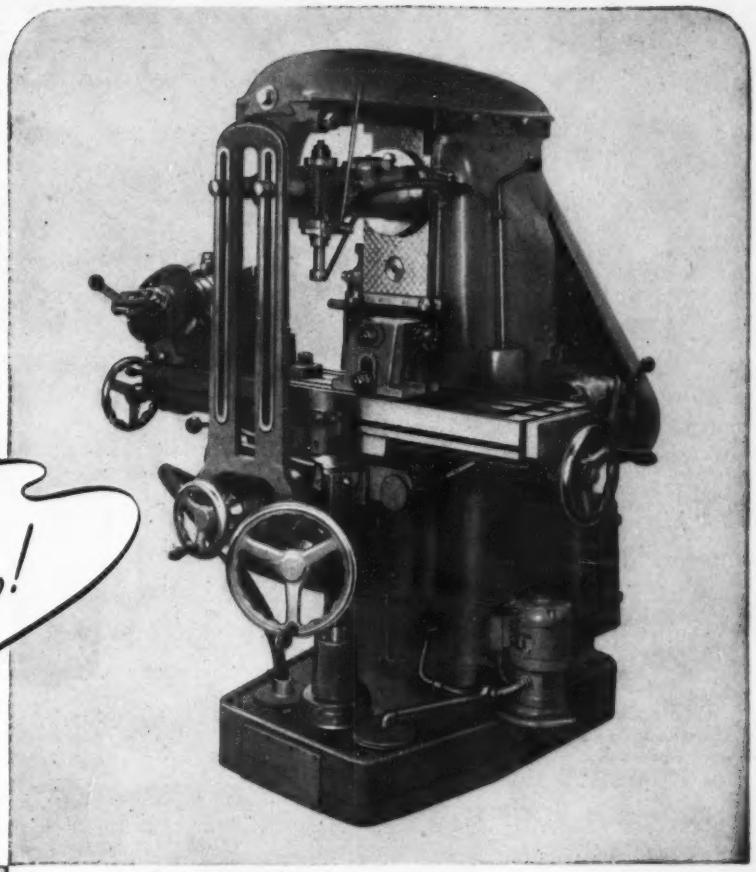
RECORDING INSTRUMENTS for Electricity

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

RECORDING INSTRUMENTS for Pressure

Bristol Co., Platts Mills, Waterbury, Conn.

(Continued on page 386)



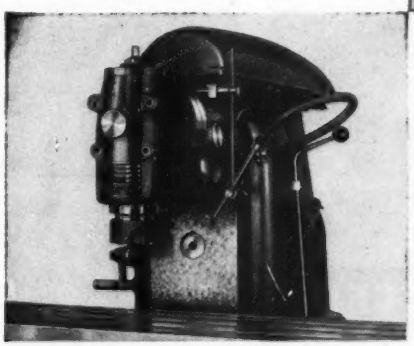
Swedish Craftsmanship!

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine



★ **Standard Equipment includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41⅛" x 9¼"
Longitudinal travel: Plain Miller	24⅛"
Universal Miller	27⅛"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

Write for Catalog



NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-E MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

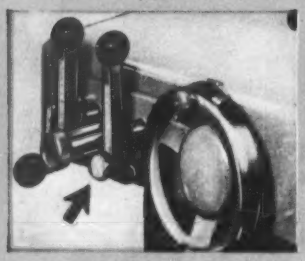
NOW... A GREAT



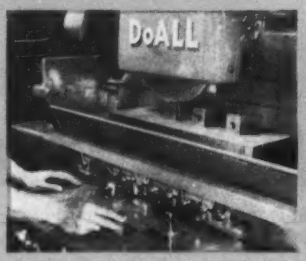
D-6 Models—6" x 18" and 6" x 24" sizes. Manual and hydraulic operation—7" wheels.



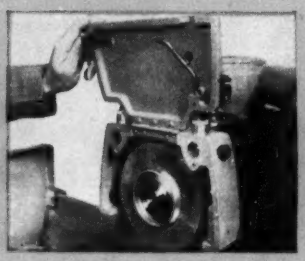
D-8 Models—8" x 24" with 10" or 14" wheels. Manual and hydraulic operation.



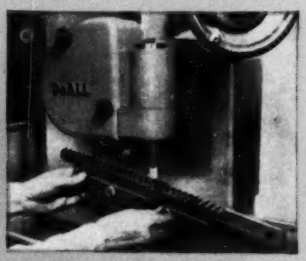
Variable speed wheel dressing feed.



Skip feed for intermittent plunge grinding.



New flood and "Cool-Grinding" system.



High speed spindle, vertical or horizontal.

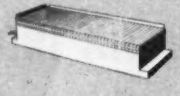
ATTACHMENTS and ACCESSORIES

1. **Coolant System** —"Cool-Grind" (coolant through the wheel) or flood grind, or both simultaneously.
2. **Coolants** for every job.
3. **New Laminated-top Magnetic Chuck.**
4. **Magnetic Sine Chuck**—for fast easy setups on single or compound angle work.
5. **Selectron**—for controlling magnetic chuck holding power—and demagnetizing.
6. **High Speed Spindle Attachment Vertical or Horizontal**—provides speeds up to 20,000 RPM, for use of very small wheels.
7. **Variable Spindle Drive**—electronic control provides infinitely variable speeds.
8. **Crush Dresser Spindle Drive**—slow-speed drive for wheel crushing.
9. **Crush Grinding Attachment**—provides steady table speeds down to 1" per minute—includes heavy duty spindle.
10. **Adjustable Crush Roll Idler Stand**—permits tilting of crush rolls.
11. **Motor-Driven Crush Roll**—for forming grinding wheel or crush rolls.
12. **Automatic Downfeed**—can be set to feed at each reversal, or alternate reversals of table.
13. **Automatic Skip Feed**—table travel speeds up between multiple work pieces when plunge grinding.

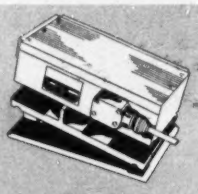




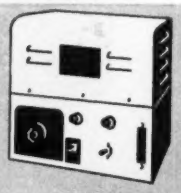
BAND MACHINES



MAGNETIC CHUCK

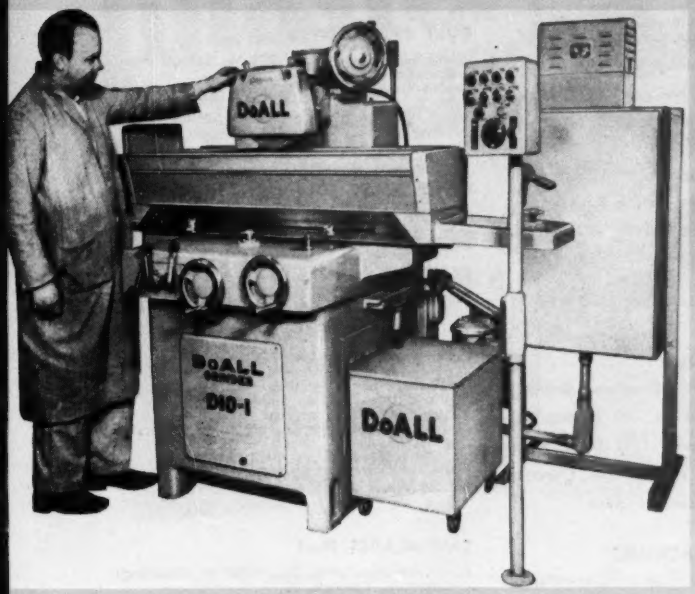


SINE CHUCK



SELECTRON

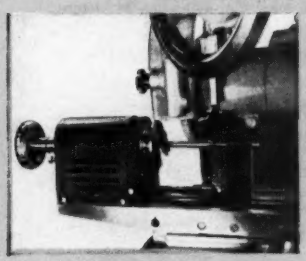
NEW LINE OF DoALL *Precision* SURFACE GRINDERS



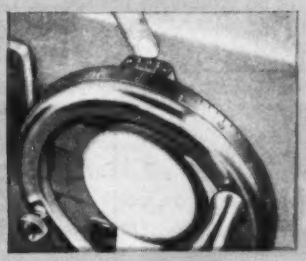
D-10 Models—10" x 30" chuck with 10" or 14" wheels.

- *NEW* SIZES—including 6" x 24" and 10" x 30".
- *NEW* 12½" WORK HEIGHT CAPACITY.
- *NEW* SPEEDS—up to 100 fpm table travel.
- *NEW* RECIRCULATING "COOL-GRINDING" SYSTEM.
- *NEW* RIGIDITY AND STURDINESS.
- *NEW* ATTACHMENTS AND ACCESSORIES.
- *NEW* CONVENIENT CONTROLS.
- *NEW* FULLY AUTOMATIC OPERATION.

...and more!



Cylindrical grinding and indexing attachment.



Slip rings for zeroing handwheels.

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with a heretofore unattainable combination of precision and speed.

You have to see them perform to visualize their capabilities. Ask to have a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY
254 N. Laurel Ave. Des Plaines, Ill.

14. **Fully Automatic Surface Grinding**—controls cross-feed and downfeed automatically.
15. **Cylindrical Grinding Attachment**—for straight and taper cylindrical grinding and indexing.
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18. **Universal Vise**—completely adjustable for holding work in any position.
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20. **Wheel Balancing Stand and Arbors.**
21. **Grinding Wheels.**
22. **Complete Electrical Panel Remote Control Systems.**

DoALL

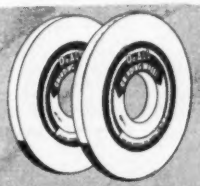
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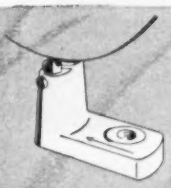
Free. Complete data and description of DoALL Grinder design and construction—coolant systems—controls—automatic setups—attachments. Ask for your copy.



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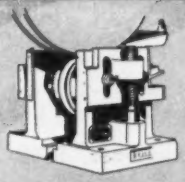
GRINDING WHEELS



DIAMOND DRESSER



DUST COLLECTOR



CRUSH ROLLS



GAGE BLOCKS

RECORDING INSTRUMENTS for Speed

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Temperature

Bristol Co., Platts Mills, Waterbury, Conn.

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U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

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Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

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RETAINING RINGS FOR BEARINGS, Etc.

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Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

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Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
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Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

RUST PREVENTIVES

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Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

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See Blast Cleaning Equipment.

SANDERS

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Millers Falls Co., Greenfield, Mass.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Skil Corp., 5039 Elston Ave., Chicago, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Tannewitz Works, 301-325 Front Ave., N. W., Grand Rapids 2, Mich.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

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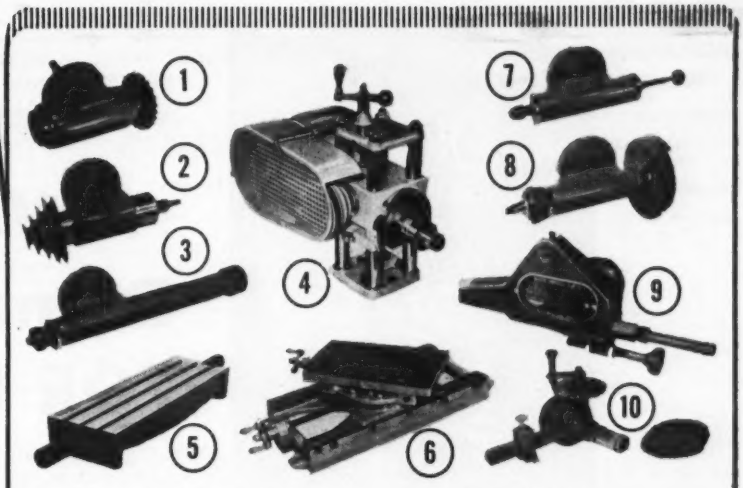


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5. Milling and Grinding Table
6. Universal Feed Table
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8. External Grinder Head
9. Slotting and Keyseating Head
10. Geared Dividing Head

Master MACHINE TOOLS

★ ★

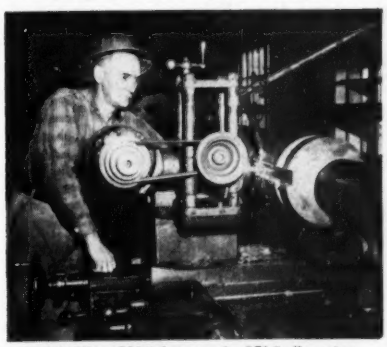
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MODEL "C," ⅓ hp — 9" TO 13" LATHES
MODEL "B," ½ OR ¾ hp — 13" TO 18" LATHES
MODEL "M," 1 OR 1½ hp — 18" TO 72" LATHES

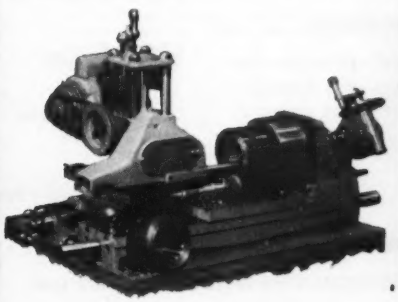
★ ★

The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, both internal and external. Therefore, the Master with its full complement of equipment is an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. These improved models of Master attachments are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our seventeen years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

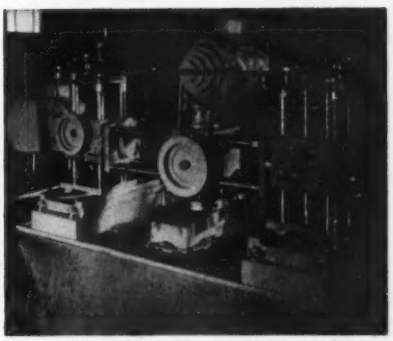
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End Milling 2½" keyway in 9⅞" diameter shaft 22 ft. long.



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Special portable milling machine made from standard Master components, variable post lengths. Power feed universal head.

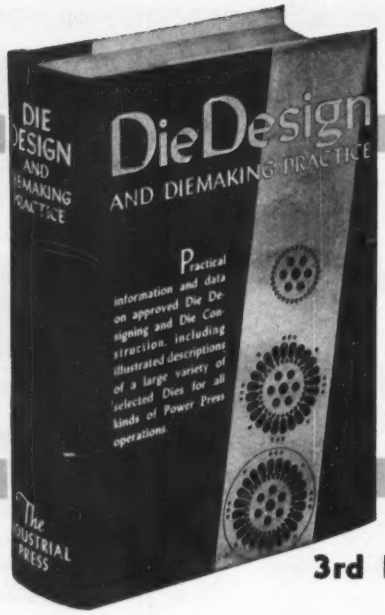


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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tannewitz Works, 301-325 Front Ave., N. W., Grand Rapids 2, Mich.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 301-325 Front Ave., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.
Skil Corp., 5039 Elston Ave., Chicago, Ill.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Eastern Mch. Screw Corp., New Haven, Conn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bristol Co., Platts Mills, Waterbury, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Hill-Clarke Machinery Co., 648 W. Washington, Chicago 6, Ill.
Miles Machinery Co., Box 770, Saginaw, Mich.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.

SHAFTS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(Continued on page 390)

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hendey Machine Co., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

SHAPERS, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

SHOP LAYOUT TEMPLETS

Repro-Templets, Inc., Oakmont, Allegheny County, Penna.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

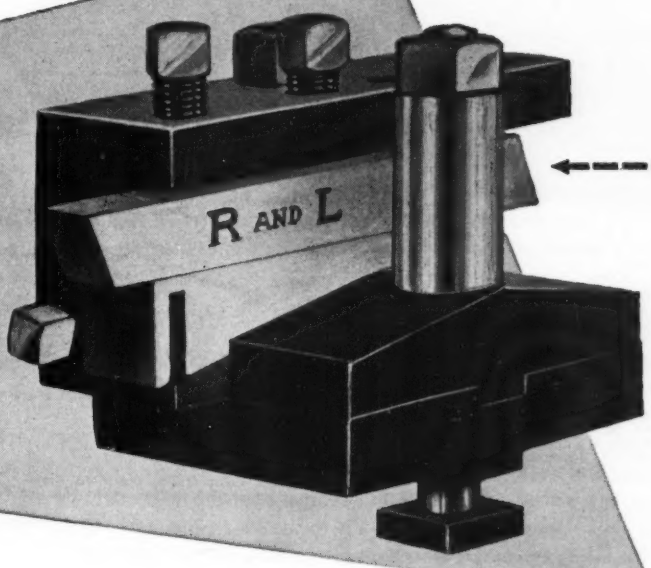
SPECIAL MACHINERY AND TOOLS

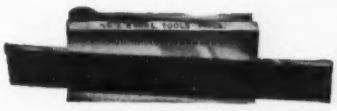
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

(Continued on page 392)

DOUBLE Duty

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The R and L Cut Off Blade Holders are precision made to flawlessly fit in the Universal Tool Post.



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Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611 Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Holliday, W. J., & Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. La Salle St., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

Steel, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Holliday, W. J., & Co., Hammond, Ind.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

STEEL ALLOYS

See Alloys, Steel.

STEEL BARS

—See Bars, Steel.

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.

(Continued on page 394)

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Kodak

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Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

STRIPPING UNITS, Die

Wales-Strippit Corp., North Tonawanda, N. Y.

STUD SETTERS

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES

See Plates, Surface.

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Electro-Snap Switch & Mfg. Co., 4218-30 West Lake St., Chicago 24, Ill.
General Electric Co., Schenectady, N. Y.
Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TACHOMETERS

Bristol Co., Platts Fails, Waterbury, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

TAPPING ATTACHMENTS AND DEVICES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Mch. Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., Detroit, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hy-Pro Tool Co., 100 Mt. Pleasant Ave., New Bedford, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

TELESCOPES, Alignment

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

THERMOMETERS, Indicating and Recording

Bristol Co., Platts Mills, Waterbury, Conn.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Tapping Mch. Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div, Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

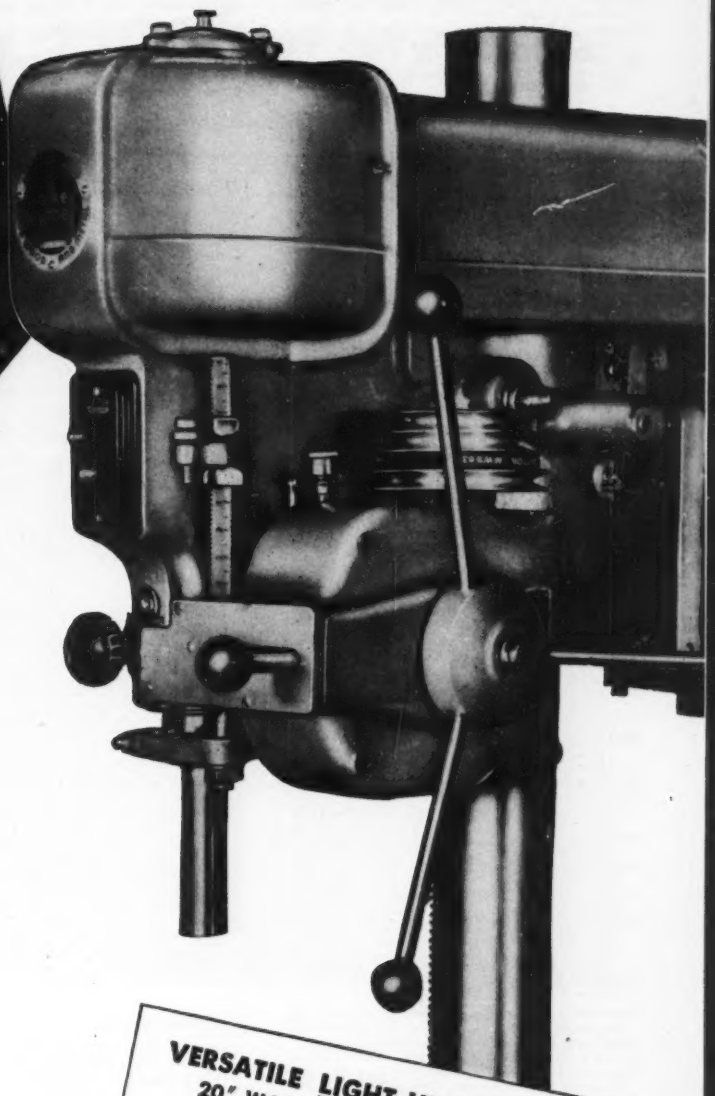
TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

(Continued on page 396)

It's no accident that

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Dept. M-12, Plainfield, N. J.
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planing Tools.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Blake, Ed., Co., 442 Cherry St., West Newton 65, Mass.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Lovejoy Tool Co., Inc., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Double Tool Co., 1036 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Colonial Broach Co., Detroit 13, Mich.
Kennametal, Inc., Latrobe, Pa.
Metal Carbide Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Colonial Broach Co., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Reliance Elec. & Engrg. Co., Collinwood Station, 1088 Ivanhoe Rd., Cleveland, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Titflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Frasse, Peter A., & Co., Inc. (Seamless), 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Philadelphia Gear Works (Motorized), Erie Ave., and G St., Philadelphia, Pa.

VALVES, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Logansport Machine Co., Inc., Logansport, Ind.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fenn Mfg. Co., Hartford, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Mch. Co., Torrington, Conn.
Logansport Machine Co., Inc., Logansport, Ind.
Martin, J. E. Mch. Works, 548 W. State St., Springfield, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Martin, J. E., Mch. Works, 548 W. State St., Springfield, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.
Standard Locknut & Lockwasher, Inc., 510 N. Capitol Ave., Indianapolis, Ind.

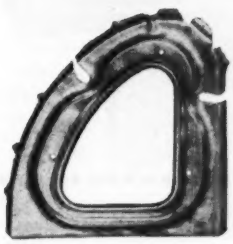
WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

(Continued on page 398)

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Formed in a Verson-Wheelon press.

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The advantages of the Verson-Wheelon method are—complete forming of flanges, eliminating hand finishing... lower first cost... elimination of expensive machine foundations... minimum plant space requirements.

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Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

WELDING POSITIONER

Johnson Machine Works, 617 Menomonie St., Eau Claire, Wis.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

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Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Sturtevant, P. A., Co., Addison, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

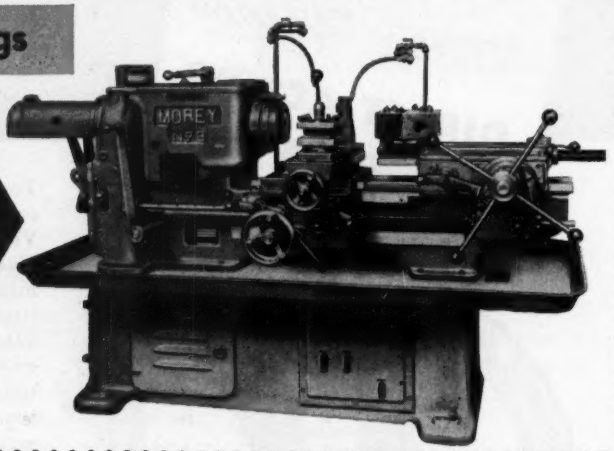
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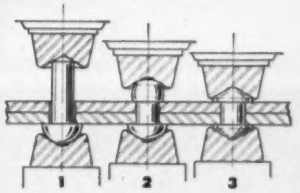
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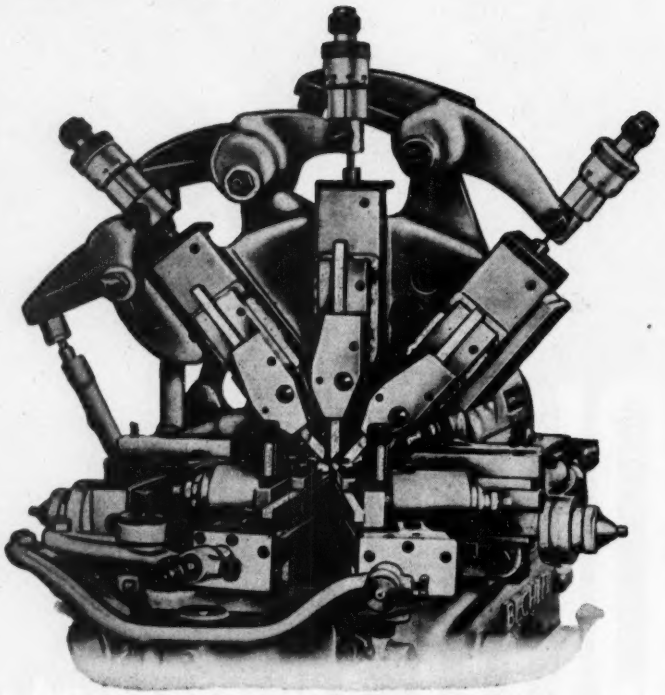
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Model AS	5/64"	5/32"	9/32"	
Model A	—	5/32"	9/32"	
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Model AS	5/64"	5/32"	9/32"	3/8"
Model A	—	5/32"	9/32"	3/8"
Model B	1/2"	5/8"	3/4"	—
Model C	1"	1¼"	—	—

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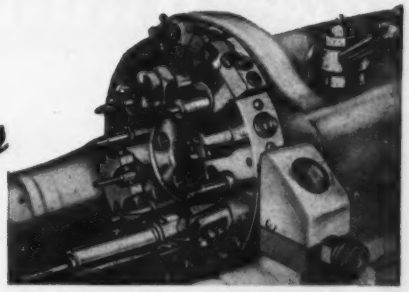
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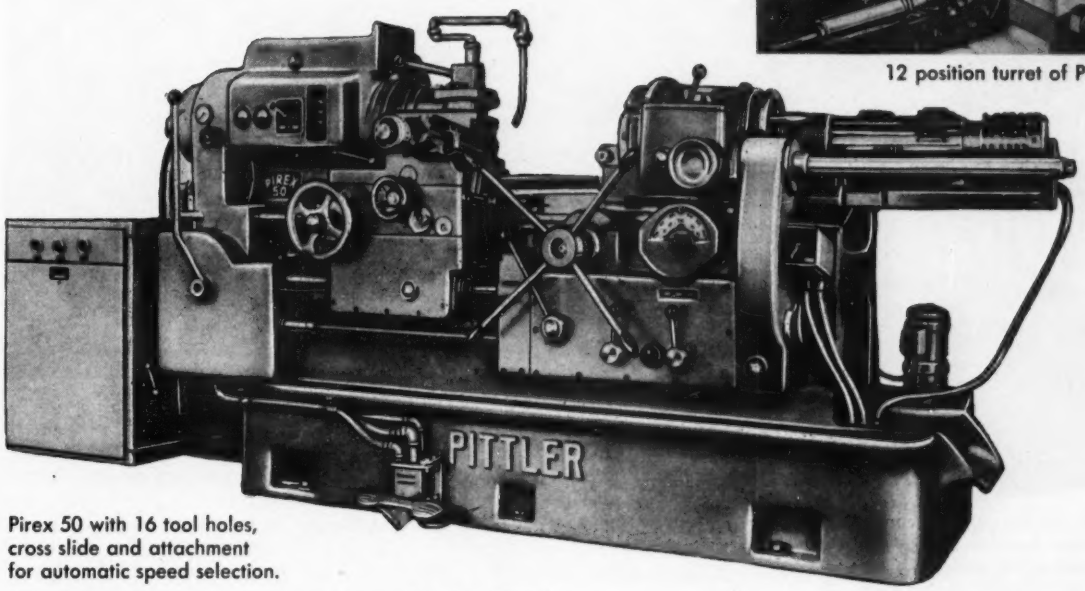
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12 position turret of Pirex 32



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Principal Specifications

	PIREX 32	PIREX 50
Bar capacity	1.25"	2"
Swing over bed	14"	15.7"
No. of Tool Holes	12	16
No. of Spindle Speeds	16	11
Spindle speed R.P.M.	71-1800	
Feeds	90-2250	18-1800
Longitudinal and transverse		
Fine i pr	.001"-.009"	.001"-.009"
Medium i pr	.002"-.020"	.002"-.020"
Coarse i pr	.004"-.040"	.004"-.040"

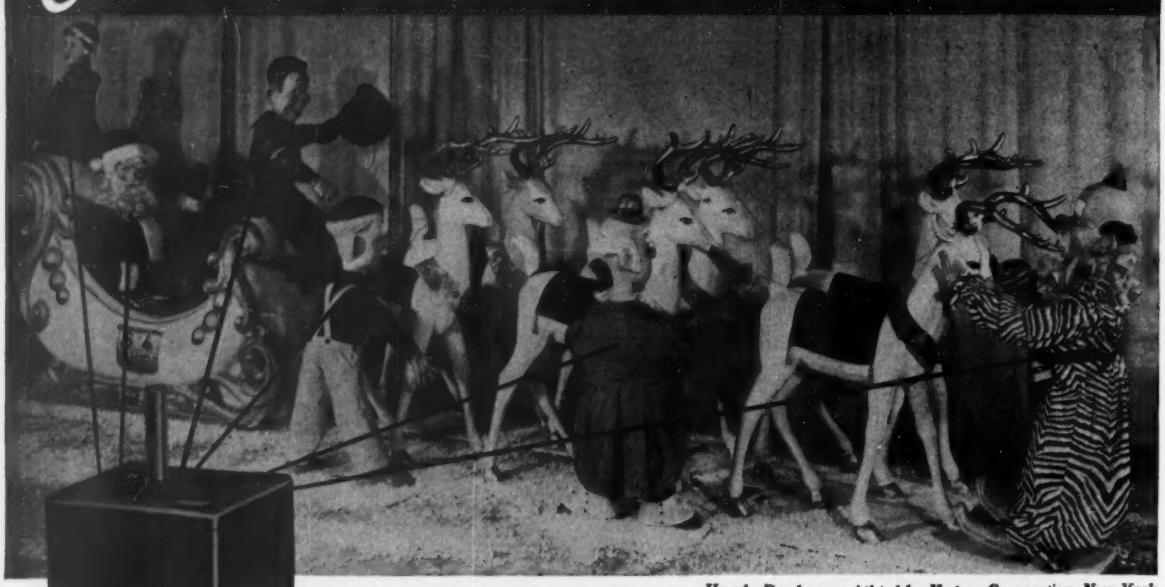
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Santa Claus STANDARDIZES WITH OHIO



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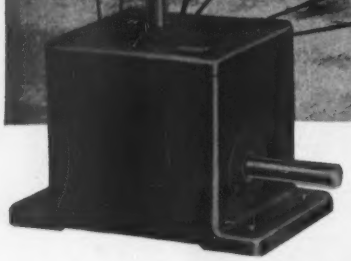


Illustration shows the VOT reducer used in animating the above Christmas display, and its location in each figure. The ratios are 100 to 1, and 60 to 1, with the BHU reducer having a ratio of 48 to 1.

About this time of year, Ohio Gear's little VOT and BHU reducers go to work for Santa Claus, grinding out smiles and giggles for kiddies at Christmas time, in store windows all over the country.

Old King Cole Displays, Inc., of Louisville, Ohio, manufacturers of animated displays, is putting a lot of faith in Ohio Gear and paying a great tribute to a reducer to keep their product operating a thousand miles from home. Ohio Gear, in turn, has the great responsibility of protecting the name and business of Old King Cole Displays, Inc.

As many as 25 to 50 reducers are used in a single Old King Cole display, such as brass bands and larger Christmas displays, and it is with great satisfaction that Old King Cole Displays know their product is insured with Ohio Gear reducers, for continuous, trouble-free performance.

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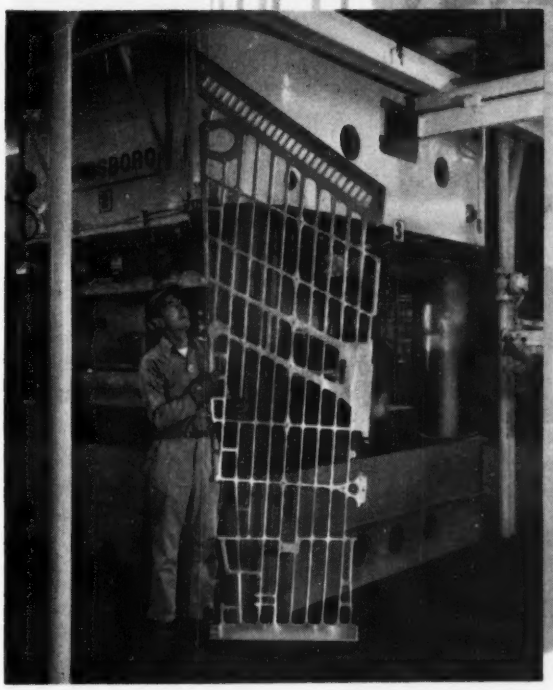
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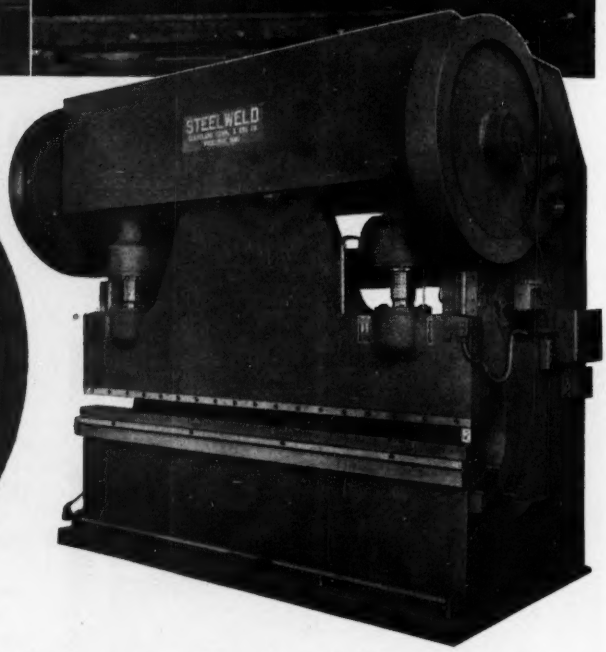
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You can shift from braking operations on 20 gauge plate to ½ inch or 1 inch plate all in the matter of a few minutes with Cleveland Steelwelds. Size of plate makes no difference as long as you keep within the tonnage rating of the machines.

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Hundreds of Cleveland Steelwelds are speeding production and cutting costs in plants in the United States and many foreign countries.



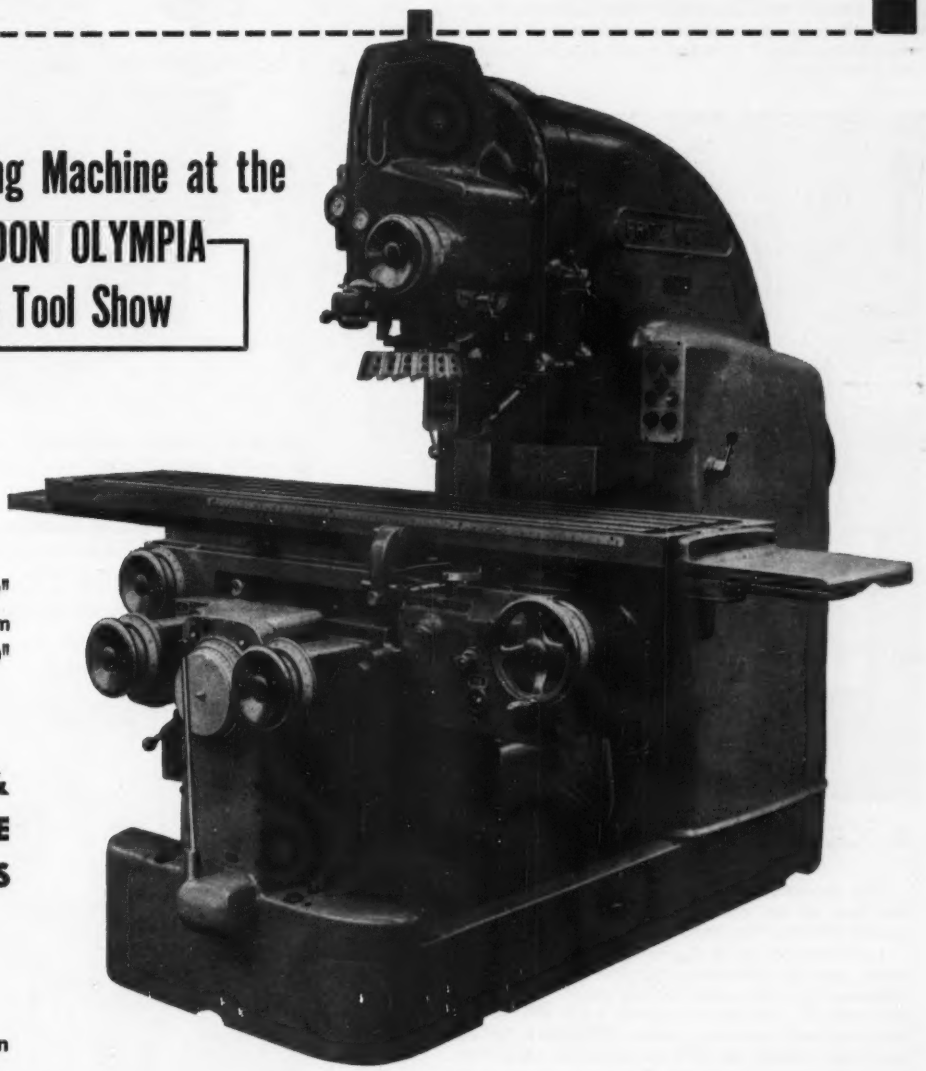
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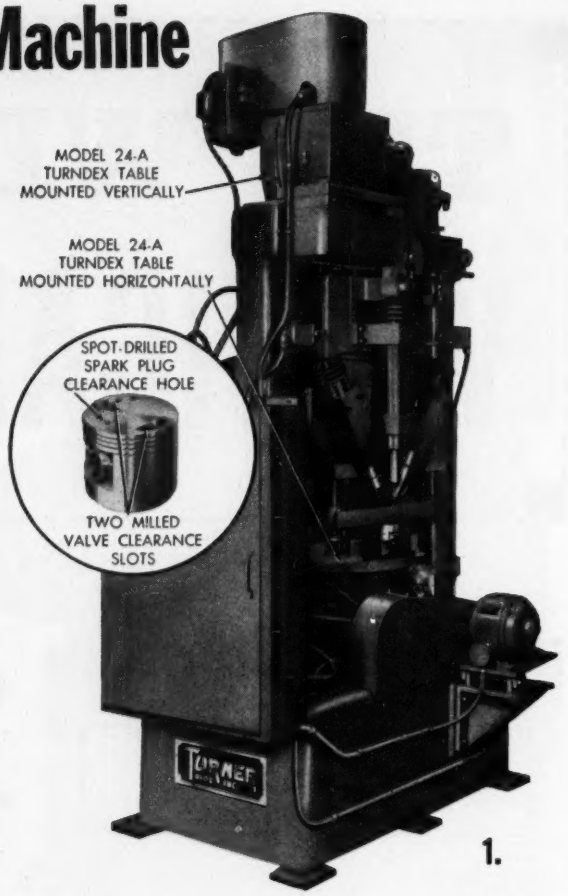
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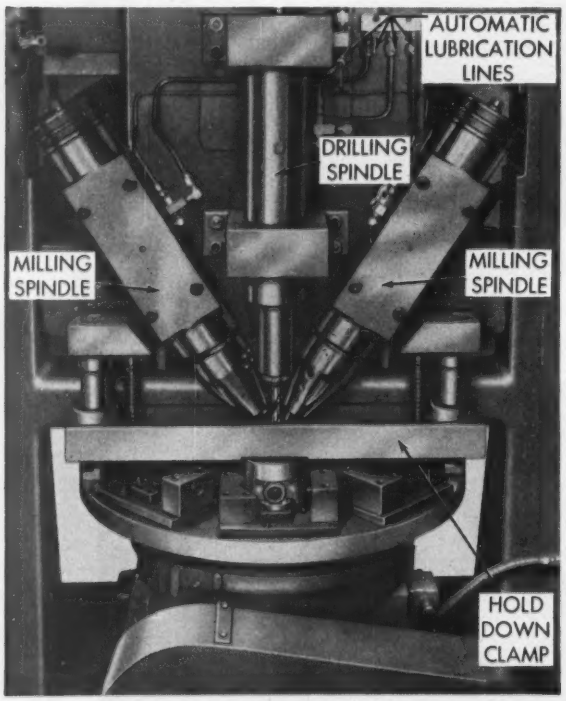
Mills and spot drills 700 pistons per hour



1.

This special piston milling and spot drilling machine was designed and built for one of the large automobile companies by Turner Bros., Inc., Ferndale, Michigan. This machine utilizes two Model 24-A Hautau-Turndex Automatic Indexing Tables. One of these Turndexes is mounted on top of the machine in a vertical position and is used to actuate the slide on which are mounted the milling spindles, drilling spindle and hold down clamp (Picture 2).

This vertically mounted Hautau-Turndex causes the cutting spindles to make a split-second approach to the work, feeds the cutting tools into the work, and when the operation is completed, the heads are rapidly returned by the Hautau-Turndex.



2. *View shows working side of machine with piston being milled and drilled.*

The horizontally mounted indexing table is located in the base of the machine (Picture 2) and has six spring loaded fixtures for holding the part to be machined.

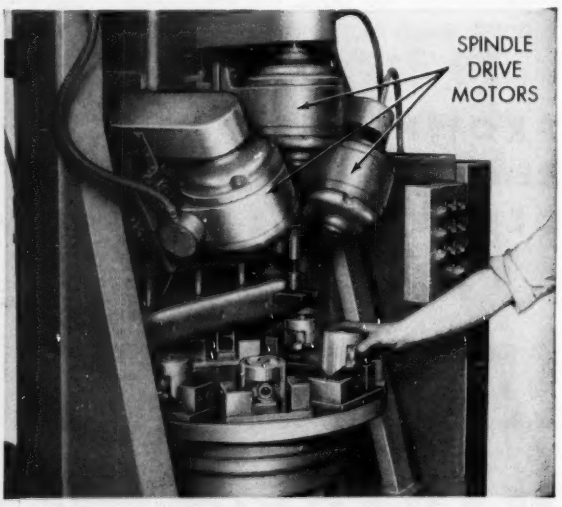
Loading is done on the opposite side of all cutting operations, thereby affording complete safety for the operator (Picture 3). The push button station (Picture 3) allows operator to perform manually each operation separately such as feed actuation, index of fixtures or operation of any work spindle as well as automatic operation.

Another feature of this Turner machine is that, should any failure occur in any operation of the machine, the automatic safety shut-off will stop the machine immediately. Until the error is corrected, the machine cannot be restarted.

The tools for this Turner machine are set with a master piston gage that is hardened and ground to simulate the actual piston. The electrical work is built to J.I.C. Standards, and all drives are separate and all motors and heads are readily accessible for repair or replacement.

This Special Turner Indexing Machine produces 700 parts per hour and production is limited only by the fact that the operator cannot load the pieces any faster.

If you have time consuming machining operations on which you would like to save on manpower, inspection time and floor space, why not write Turner Bros., Inc., 2625 Hilton Road, Ferndale 20, Michigan, describing your problem?



3. *Operator loads machine in complete safety on opposite side of cutting operations.*

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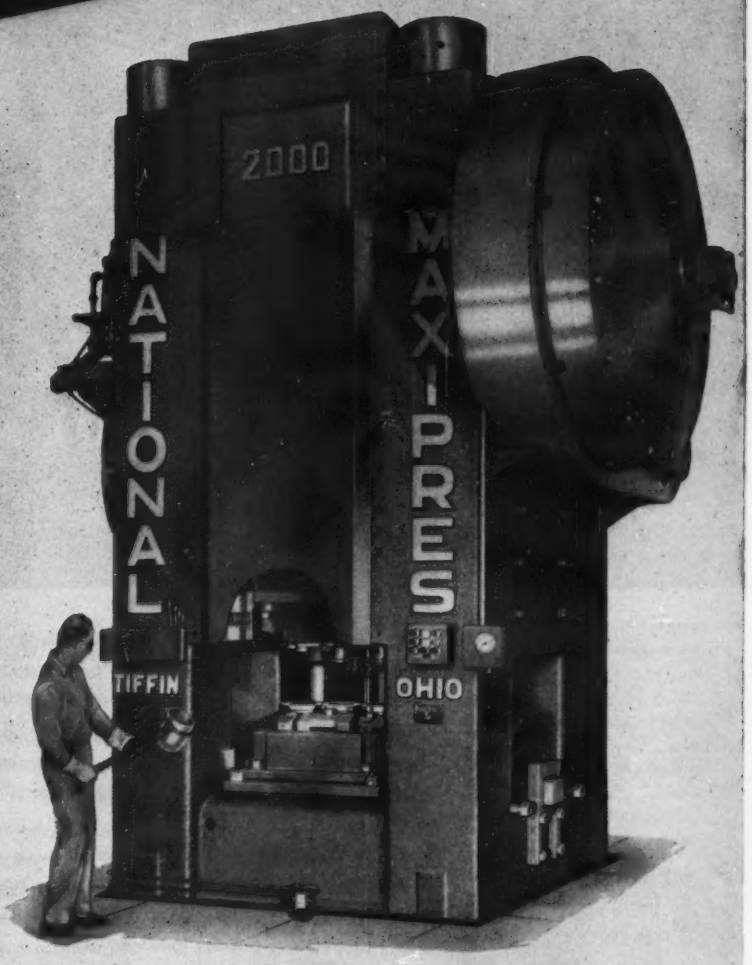
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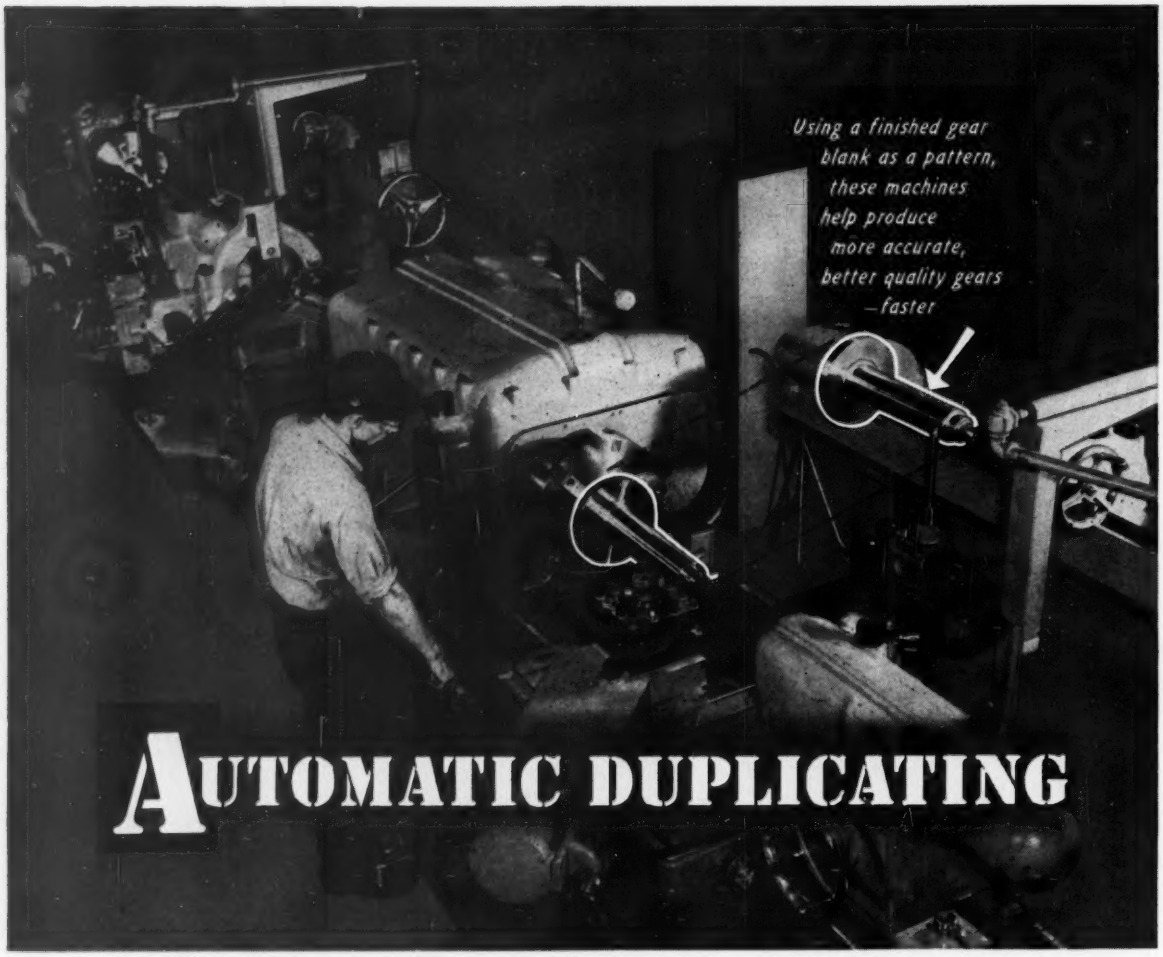


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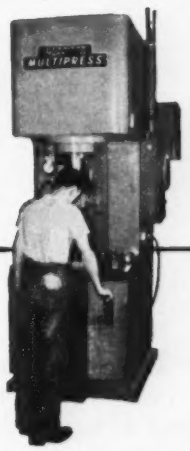
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More proof that the right use of hydraulic pressure cuts staking costs several ways! General Electric's own experience with Multipress, in their Meter and Instrument Division, echoes gains reported by dozens of other users.

With Multipress, ram speeds and pressures are closely adjustable to each different job need, and are *automatically controlled* for continuous accuracy. This eliminates the need for skilled operators.

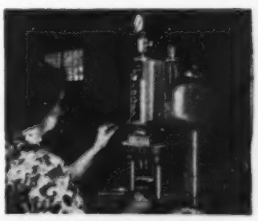
In addition, Multipress does the work *without sudden impact.* Working pressures build up *after* tooling contacts the parts. Among other advantages, this cuts tool wear and ends a major cause of tool damage.

But Multipress assures even bigger gains in reduced scrap losses, because its smooth action lets metals "flow" into place without losing their normal tension characteristics. At G-E, scrap on staking operations had often run from 5 to 25 per cent. Multipress cut these losses to *one per cent or less.*

Ease and safety of operation—plus quietness—are added Multipress features. And most Multipress advantages apply also to many other production jobs—bending, drawing, flaring, stamping, forming, blanking, riveting, and so on.

Write today for full information on Multipress and its many accessories for special needs.

Multipress offers 8 frame sizes. Capacities range from one-ton to the 50-ton unit shown directly above. Model at upper left, equipped with Multipress Index Table, automatically rotates parts under press ram. Note handy storage of parts at center of table dial.



The Multipress "Midget" offers one-ton capacity.

The DENISON Engineering Company
1152 Dublin Road, Columbus 16, Ohio

DENISON HydrOILics

Jenny doesn't live here any more!



YES, in the modern coal mine there's no room for Jenny. Today her job is done by powerful electric locomotives capable of pulling 50 times the load Jenny used to haul to the mine surface.

As a matter of fact, in the modern mine even the traditional pick and shovel are as out-of-place as Jenny herself! More than 90% of *bituminous* coal is now mechanically cut, and over 70% is mechanically loaded. Result: more economical coal to light the way, fuel the fires, power the progress of America.

But, basically, what caused Jenny to disappear? What's behind American industry's evermore efficient machines that turn out goods at lower cost—thus making them available to more people? One word tells the story—COMPETITION.

In the coal industry there are 5,000 privately managed coal companies competing with one another and all competing in the market with other fuels. When one coal company develops more efficient mining methods, the rest can keep pace only by striving to improve even further. No wonder that with his modern machines, developed through competition, the American miner's daily output is 4 to 24 times that of any miner in Europe or Asia—most of whom work in government-controlled coal industries.

Just as competition spurs *you* on to trying harder—it's competition that goads the individual company to deliver products that will outsell others. And it's competition that keeps a whole industry on its toes, cutting distribution costs, opening up new outlets, and delivering better products.

Competition—not government control—has already made America the most productive nation on earth. Competition—not regimentation—points the way to ever greater plenty for all of us.

★ ★ ★

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Overhang Sub-Press



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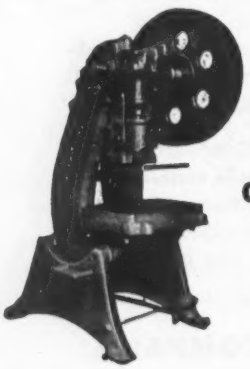
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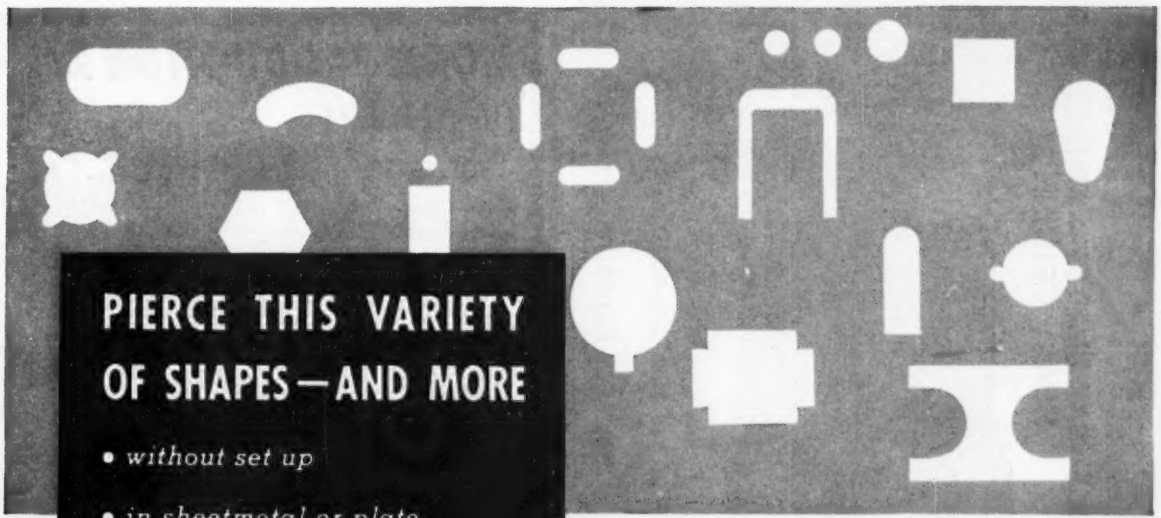


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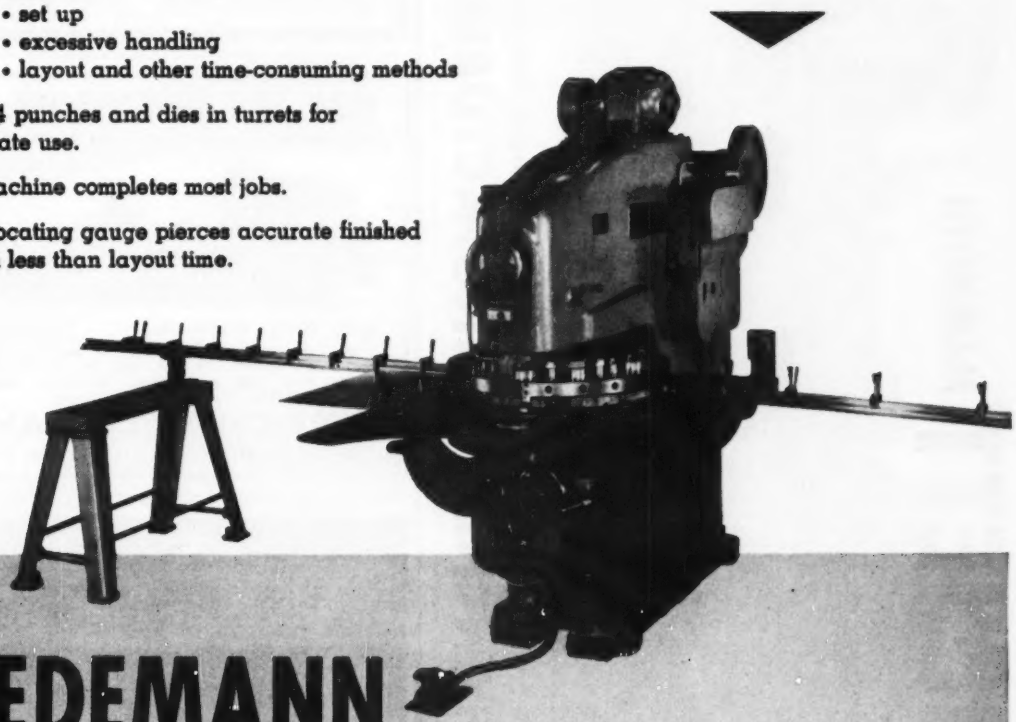
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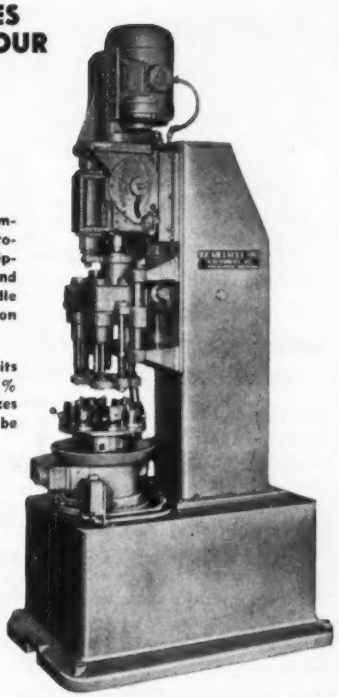
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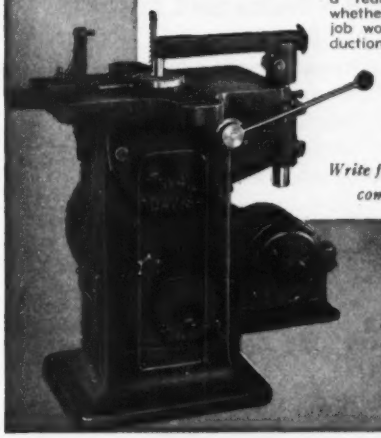
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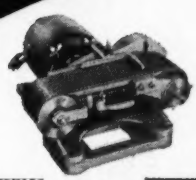


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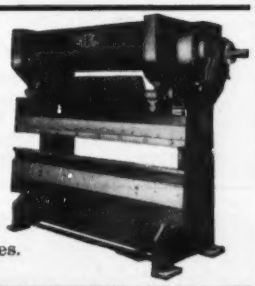
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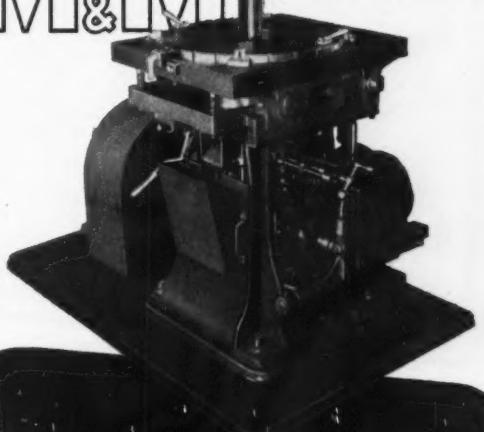
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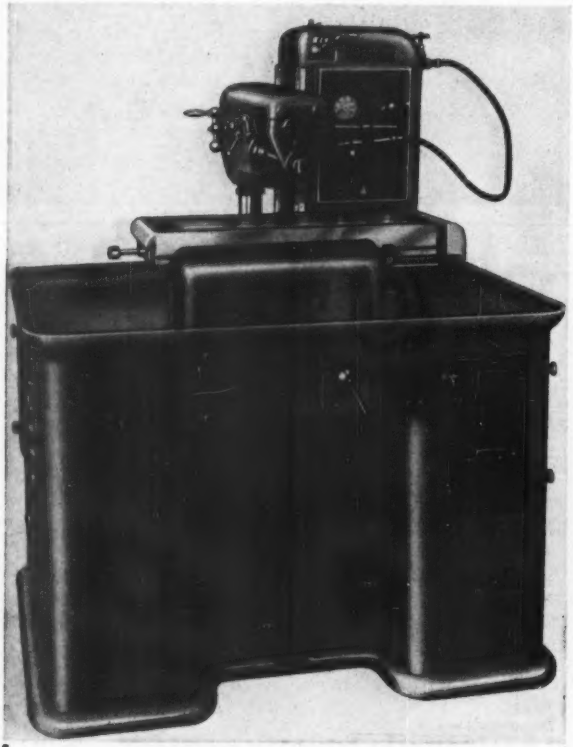
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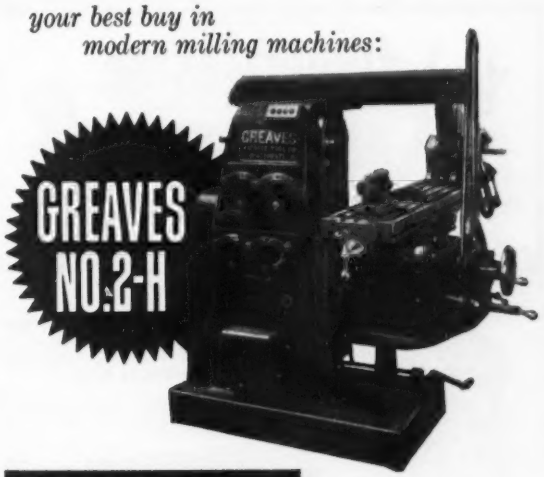
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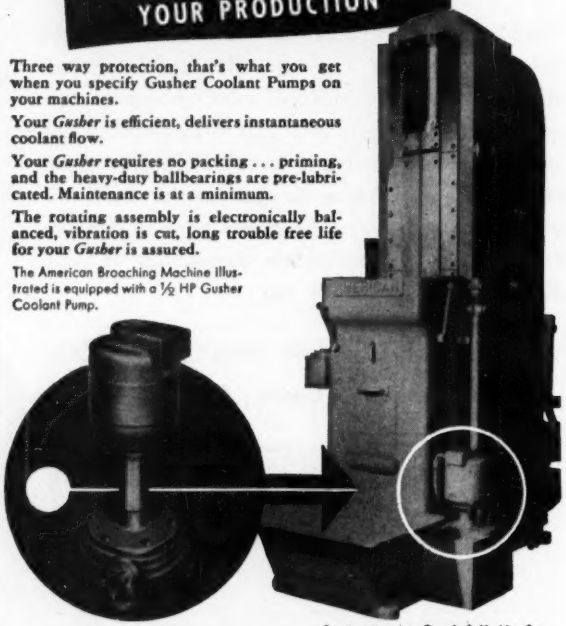
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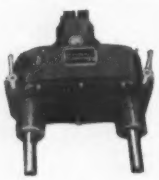


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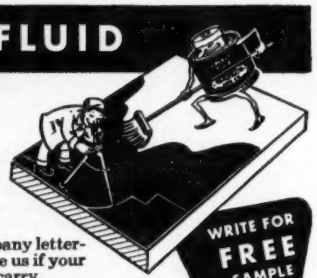
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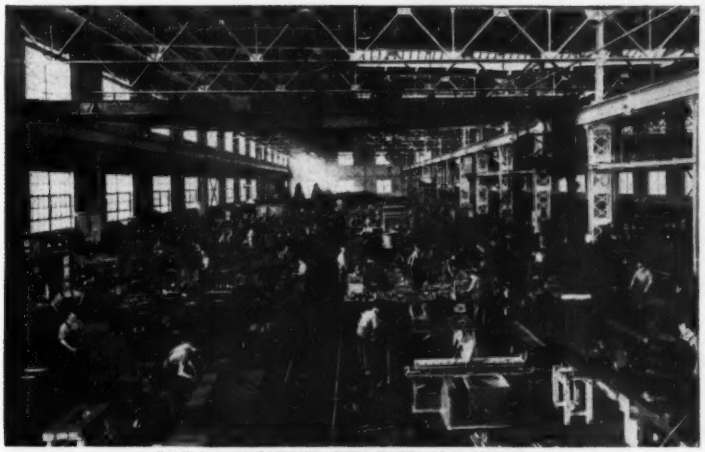


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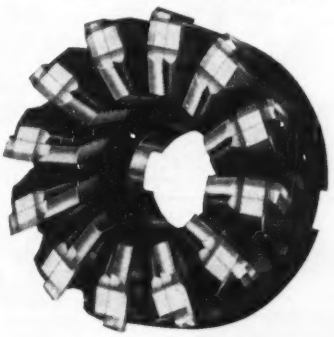
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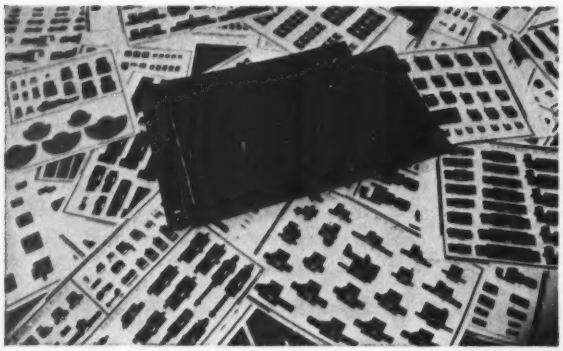


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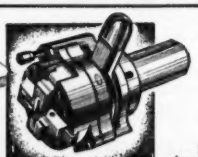
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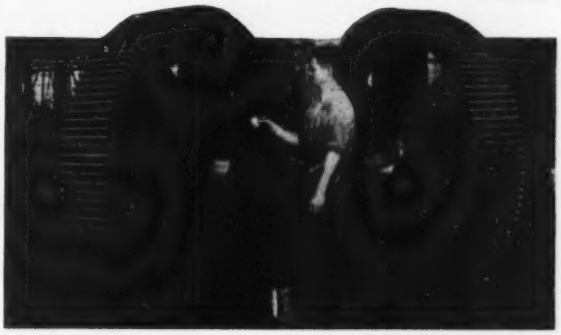
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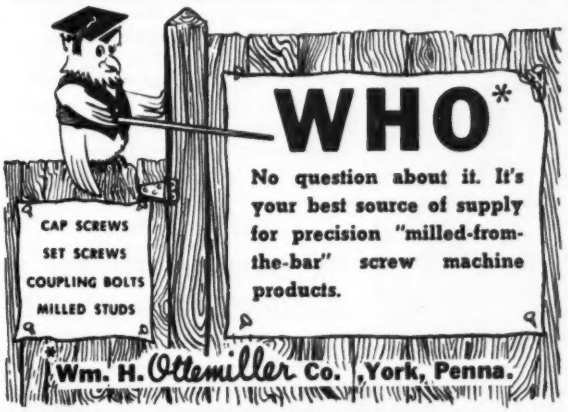


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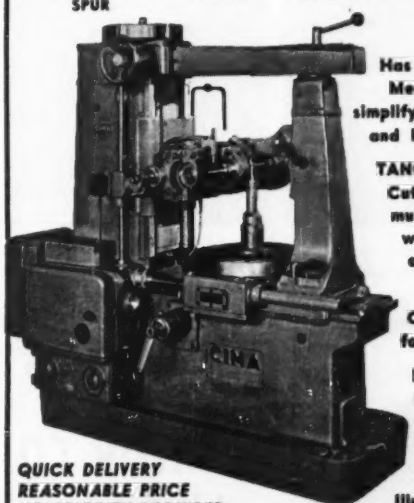
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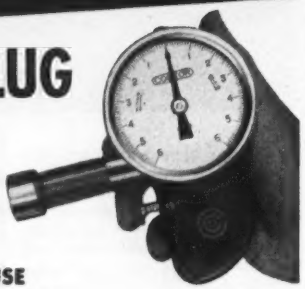
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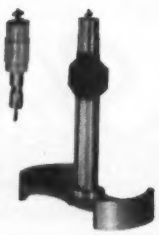
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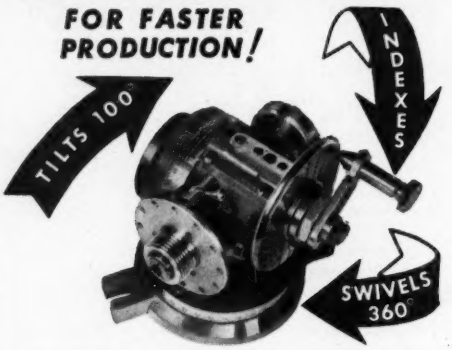
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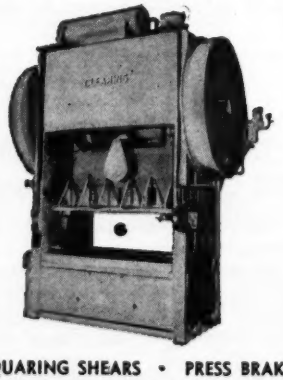
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One of three Cleveland special 70AT units driving a woolen card at one of the large textile mills in New Hampshire. The unit pictured drives the main card cylinder, stripper rolls and the fancy roll. There are powerful, right-angle Cleveland drives for every type of service.

Compact Cleveland drive is powerful, sure and safe

● Adequate aisle space is essential in a woolen mill—so units that drive woolen cards must be compact, yet powerful enough to do the job. That's why the Davis and Furber Machine Company of North Andover, Massachusetts, has made Cleveland Worm Gear Speed Reducers standard equipment on its new Model L carding machine.

In addition to allowing needed space between cards, Cleveland drives mean safer working conditions. Large diameter pulleys and flat belting, once a serious safety hazard, are eliminated.

Cleveland is first choice for any job where a powerful, trouble-free, right-angle drive is desired. Engineers know from experience that they can depend on Clevelands, wherever they serve. They give satisfactory service, no matter how severe the conditions.

For specifications and other details, write for our current catalog. The Cleveland Worm & Gear Company, 3276 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.



CLEVELAND
Worm Gear
Speed Reducers

8-speed Atlas miller gets greater spindle accuracy with TIMKEN® bearings

THIS Atlas MFC milling machine has 8 speeds, from 62 to 2870 RPM. It handles the full range of milling, from slabbing and facing cuts to end milling, keyways, finishing and layout work. And no matter what the speed or job, its spindle is held in accurate alignment by Timken® precision bearings. Precision milling is assured.

Due to their tapered construction, Timken bearings carry both radial and thrust loads in any combination. They can be adjusted to any desired preload to prevent chatter and provide maximum rigidity.

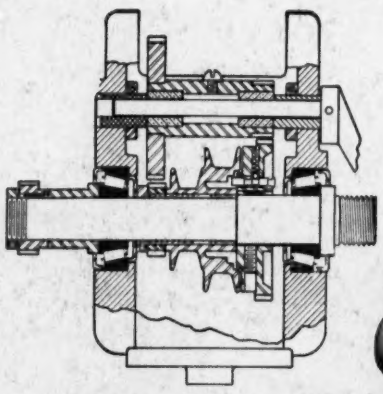
Timken precision bearings are made specifically for precision spindle applications. Timken "Double Zero" bearings are available with a maximum run-out of only 75 millionths of an inch (.000075″).

Because of their line contact between rollers and races, Timken bearings provide more than enough capacity for any tool load. And because of their true rolling motion and incredibly smooth surface finish, friction is practically eliminated.

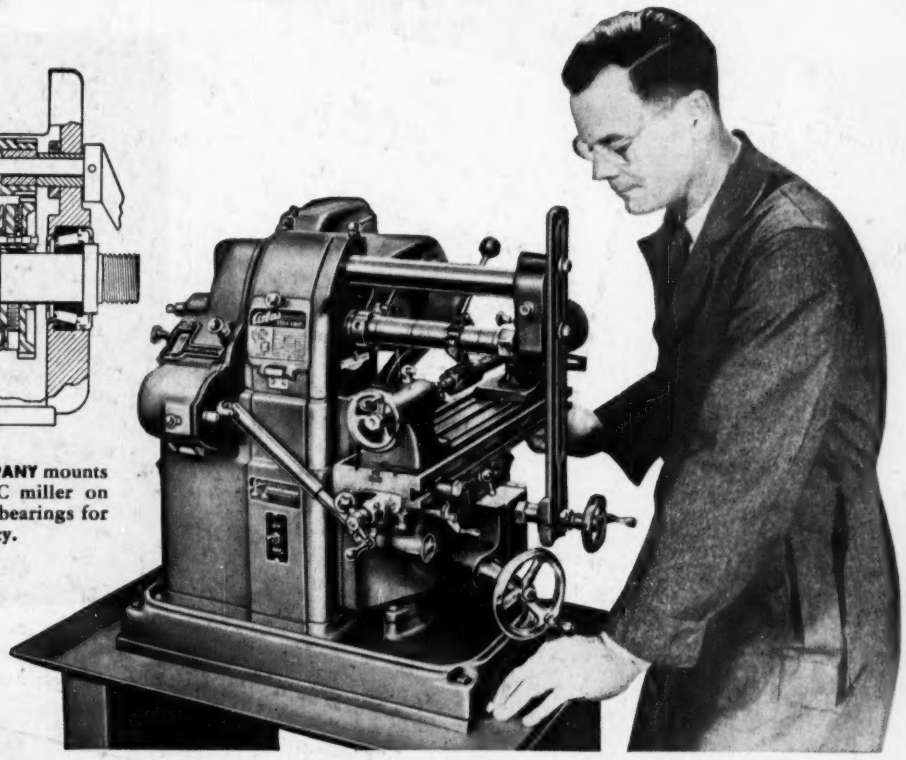
Timken bearings reduce machine tool manufacturing costs too. No special thrust bearings are needed. Assembly and set-up of the bearings are quick and simple.

Get all the advantages only Timken bearings offer you by specifying them for the machine tools you build or buy. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **ATLAS PRESS COMPANY** mounts the spindle of its MFC miller on Timken tapered roller bearings for greater spindle accuracy.





FINISHED TO CLOSER TOLERANCES

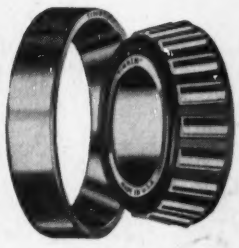
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



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